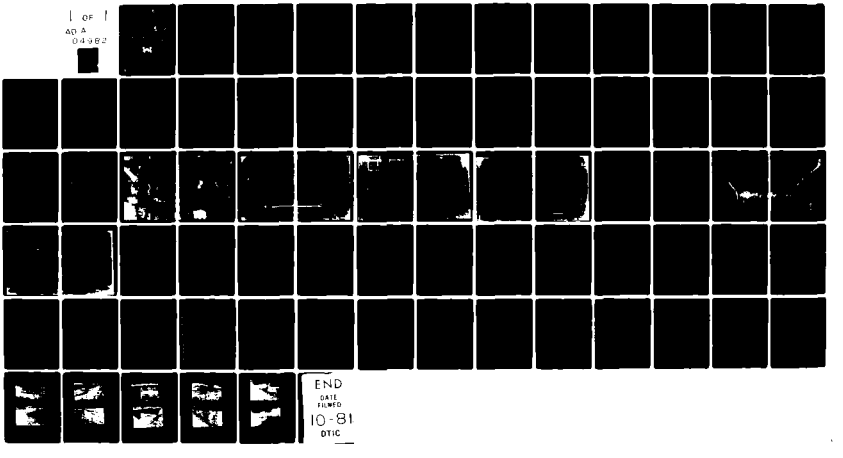
AD-A104 982 ANDERSON ENGINEERING INC SPRINGFIELD MO F/G 13/13
NATIONAL DAM SAFETY PROGRAM. ROGERS DAM (MO 10370), MISSOURI - --ETC(U)
DEC 78 J M HEALY, S L BRADY DACW43-78-C-0166
UNCLASSIFIED NL

1 OF 1
AD A 104982



END
DATE FILMED
10-81
DTIC

MISSOURI - KANSAS CITY BASIN

ROGERS DAM
HOWARD COUNTY, MISSOURI
MO 10370

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY: U. S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

DECEMBER 1978

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A104 782	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Phase I Dam Inspection Report National Dam Safety Program Rogers Lake Dam (MO 10370) Howard County, Missouri	5. TYPE OF REPORT & PERIOD COVERED Final Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Anderson Engineering, Inc.	8. CONTRACT OR GRANT NUMBER(s) DACW43-78-C-0166
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	12. REPORT DATE December 1978 13. NUMBER OF PAGES Approximately 55
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)* National Dam Safety Program. Rogers Dam (MO 10370), Missouri - Kansas City Basin, Howard County, Missouri. Phase I Inspection Report.	15. SECURITY CLASS. *(of this report)* UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT *(of this Report)* Approved for release; distribution unlimited.	
17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*	
18. SUPPLEMENTARY NOTES	
19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)* Dam Safety, Lake, Dam Inspection, Private Dams	
20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)* This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.	

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

INSTRUCTIONS FOR PREPARATION OF REPORT DOCUMENTATION PAGE

RESPONSIBILITY. The controlling DoD office will be responsible for completion of the Report Documentation Page, DD Form 1473, in all technical reports prepared by or for DoD organizations.

CLASSIFICATION. Since this Report Documentation Page, DD Form 1473, is used in preparing announcements, bibliographies, and data banks, it should be unclassified if possible. If a classification is required, identify the classified items on the page by the appropriate symbol.

COMPLETION GUIDE

General. Make Blocks 1, 4, 5, 6, 7, 11, 13, 15, and 16 agree with the corresponding information on the report cover. Leave Blocks 2 and 3 blank.

Block 1. Report Number. Enter the unique alphanumeric report number shown on the cover.

Block 2. Government Accession No. Leave Blank. This space is for use by the Defense Documentation Center.

Block 3. Recipient's Catalog Number. Leave blank. This space is for the use of the report recipient to assist in future retrieval of the document.

Block 4. Title and Subtitle. Enter the title in all capital letters exactly as it appears on the publication. Titles should be unclassified whenever possible. Write out the English equivalent for Greek letters and mathematical symbols in the title *(see "Abstracting Scientific and Technical Reports of Defense-sponsored RDT/E," AD-667 000)*. If the report has a subtitle, this subtitle should follow the main title, be separated by a comma or semicolon if appropriate, and be initially capitalized. If a publication has a title in a foreign language, translate the title into English and follow the English translation with the title in the original language. Make every effort to simplify the title before publication.

Block 5. Type of Report and Period Covered. Indicate here whether report is interim, final, etc., and, if applicable, inclusive dates of period covered, such as the life of a contract covered in a final contractor report.

Block 6. Performing Organization Report Number. Only numbers other than the official report number shown in Block 1, such as series numbers for in-house reports or a contractor/grantee number assigned by him, will be placed in this space. If no such numbers are used, leave this space blank.

Block 7. Author*(s)*. Include corresponding information from the report cover. Give the name*(s)* of the author*(s)* in conventional order *(for example, John R. Doe or, if author prefers, J. Robert Doe)*. In addition, list the affiliation of an author if it differs from that of the performing organization.

Block 8. Contract or Grant Number*(s)*. For a contractor or grantee report, enter the complete contract or grant number*(s)* under which the work reported was accomplished. Leave blank in in-house reports.

Block 9. Performing Organization Name and Address. For in-house reports enter the name and address, including office symbol, of the performing activity. For contractor or grantee reports enter the name and address of the contractor or grantee who prepared the report and identify the appropriate corporate division, school, laboratory, etc., of the author. List city, state, and ZIP Code.

Block 10. Program Element, Project, Task Area, and Work Unit Numbers. Enter here the number code from the applicable Department of Defense form, such as the DD Form 1498, "Research and Technology Work Unit Summary" or the DD Form 1634. "Research and Development Planning Summary," which identifies the program element, project, task area, and work unit or equivalent under which the work was authorized.

Block 11. Controlling Office Name and Address. Enter the full, official name and address, including office symbol, of the controlling office. *(Equates to funding/sponsoring agency. For definition see DoD Directive 5200.20, "Distribution Statements on Technical Documents.")*

Block 12. Report Date. Enter here the day, month, and year or month and year as shown on the cover.

Block 13. Number of Pages. Enter the total number of pages.

Block 14. Monitoring Agency Name and Address *(if different from Controlling Office)*. For use when the controlling or funding office does not directly administer a project, contract, or grant, but delegates the administrative responsibility to another organization.

Blocks 15 & 15a. Security Classification of the Report: Declassification/Downgrading Schedule of the Report. Enter in 15 the highest classification of the report. If appropriate, enter in 15a the declassification/downgrading schedule of the report, using the abbreviations for declassification/downgrading schedules listed in paragraph 4-207 of DoD 5200.1-R.

Block 16. Distribution Statement of the Report. Insert here the applicable distribution statement of the report from DoD Directive 5200.20, "Distribution Statements on Technical Documents."

Block 17. Distribution Statement *(of the abstract entered in Block 20, if different from the distribution statement of the report)*. Insert here the applicable distribution statement of the abstract from DoD Directive 5200.20, "Distribution Statements on Technical Documents."

Block 18. Supplementary Notes. Enter information not included elsewhere but useful, such as: Prepared in cooperation with . . . Translation of *(or by)* . . . Presented at conference of . . . To be published in . . .

Block 19. Key Words. Select terms or short phrases that identify the principal subjects covered in the report, and are sufficiently specific and precise to be used as index entries for cataloging, conforming to standard terminology. The DoD "Thesaurus of Engineering and Scientific Terms" *(TEST)*, AD-672 000, can be helpful.

Block 20. Abstract. The abstract should be a brief *(not to exceed 200 words)* factual summary of the most significant information contained in the report. If possible, the abstract of a classified report should be unclassified and the abstract to an unclassified report should consist of publicly- releasable information. If the report contains a significant bibliography or literature survey, mention it here. For information on preparing abstracts see "Abstracting Scientific and Technical Reports of Defense-Sponsored RDT&E," AD-667 000.

☆ U.S. G.P.O. 1980-665-141/1296

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: Rogers Dam Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Rogers Dam. It was prepared under the National Program of Inspection of Non-Federal Dams.

SUBMITTED BY: SIGNED
Chief, Engineering Division

1 MAR 197-
Date

APPROVED BY: SIGNED
Colonel, CE, District Engineer

1 MAR 1975
Date

ROGERS DAM
HOWARD COUNTY, MISSOURI
MISSOURI INVENTORY NO. 10370

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Prepared By

Anderson Engineering, Inc., Springfield, Missouri
Hanson Engineers, Inc., Springfield, Illinois

For

The Governor of Missouri

December, 1978

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Rogers Dam
State Located:	Missouri
County Located:	Howard County
Stream:	Unnamed Tributary to Adams Fork
Date of Inspection:	15 September 1978

Rogers Dam was inspected by an interdisciplinary team of engineers from Anderson Engineering, Inc. of Springfield, Missouri and Hanson Engineers, Inc. of Springfield, Illinois. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers, and they have been developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam has been classified by the St. Louis District Corps of Engineers as an intermediate size dam with a high downstream hazard potential. Their estimate of the damage zone extends 10 miles downstream of the dam. The floodplain includes part of the city of Fayette, Missouri (population 3500), which is one mile downstream of the dam. Within the first four miles downstream of the dam are 15 houses, three improved road bridges, one state highway bridge and one railroad bridge.

Our inspection and evaluation indicates that the combined spillways do not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. The combined spillways will pass 73 percent of the Probable Maximum Flood without overtopping. The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The guidelines require that a dam of intermediate size with a high downstream hazard potential pass 100 percent of the PMF. The combined spillways will pass a 100 year flood without overtopping. A 100 year flood is one that has a 1 percent chance of being exceeded in any given year.

The embankment and appurtenances are generally in good condition. Deficiencies included erosion on the downstream portion of the embankment and especially in the area of the primary spillway stilling basin. Also, the outlet pipe for the drainage blanket drain pipe could not be found. Another deficiency was the lack of seepage and stability analysis records. A detailed report is attached to be submitted to the owners and to the Governor of Missouri.

John M. Healy

John M. Healy, P.E.
Hanson Engineers, Inc.

Steven L. Brady

Steven L. Brady, P.E.
Anderson Engineering, Inc.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
ROGERS DAM - ID No. 10370

TABLE OF CONTENTS

APPENDICES

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL:

A. Authority:

The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of Rogers Dam in Howard County, Missouri be made.

B. Purpose of Inspection:

The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and a visual inspection in order to determine if the dam poses hazards to human life or property.

C. Evaluation Criteria:

Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed with the help of several federal agencies and many state agencies, professional engineering organizations, and private engineers.

1.2 DESCRIPTION OF PROJECT:

A. Description of Dam and Appurtenances:

Rogers Dam is an earth fill structure approximately 44.5 ft high and 1350 ft long at the crest. The appurtenant works consist of a concrete drop inlet and reinforced concrete pipe primary spillway, which is located at the south abutment and an earth and rock cut emergency spillway, which is located at the north abutment. Sheet 3 of Appendix A shows a plan of the embankment and spillways and a typical section of the embankment.

B. Location:

The dam is located in the center of Howard County, Missouri on a small tributary of Adams Fork. The dam and lake are within the Fayette Missouri 7 1/2 minute quadrangle sheet one mile northwest of Fayette, Missouri (Sections 3, 4 and 10, T50N, R16W-latitude 39°09.3'; longitude 92° 42.5').

Sheet 1 of Appendix A shows the general vicinity, and Sheet 2 of Appendix A shows a plan of the immediate area of the dam and lake.

C. Size Classification:

With an embankment height of 44.5 ft and a maximum storage capacity of approximately 4400 acre-ft, the dam is in the intermediate size category.

D. Hazard Classification:

The St. Louis District, Corps of Engineers has classified this dam as a high hazard dam. Their estimate of the potential damage zone extends 10 miles downstream of the dam. The floodplain includes part of the city of Fayette, Missouri (population 3500), which is one mile downstream of the dam. Within the first four miles downstream of the dam are 15 houses, three improved road bridges, one state highway bridge and one railroad bridge.

E. Ownership:

The dam is owned by the city of Fayette, Missouri whose address is City Hall, Fayette, Missouri 65248.

F. Purpose of Dam:

The purpose of the dam is to provide water supply to the city of Fayette with some recreational benefits.

G. Design and Construction History:

The dam was designed by Larkin and Associates of Kansas City. The construction of the dam was under the inspection of a temporary city employee (Mr. Gordon S. McKenty) who reported to Larkin and Associates. Mr. McKenty was not the inspector during the latter stages of the dam construction. The dam was completed in 1970. Design plans and specifications are available and have been used to prepare this report. No significant problems in regards to seepage through or stability of the embankment are reported to have occurred since the dam was built. To our knowledge, no modifications have been made to the dam.

H. Normal Operating Procedure:

Normal flows will be passed by a drop inlet spillway, whereas an earth and rock cut emergency spillway would come into operation for major floods. The lake is used for water supply for the city of Fayette in combination with an older lake which exists upstream in the same valley. Mr. McKenty indicated that he believed that the emergency spillway has come into service only once.

1.3 PERTINENT DATA:

Pertinent data about the dam, appurtenant works, and reservoir are presented in the following paragraphs. Sheet 3 of Appendix A is a plan of the embankment and spillways with a typical cross section of the dam. Sheet 4 presents details of the service spillway. Sheet 5 presents a plan and cross sections of the stilling basin.

A. Drainage Area:

The drainage area for this dam, as obtained from the U.S.G.S. quad sheet is equal to approximately 2510 acres.

B. Elevations (Feet Above M.S.L.):

(1) Top of dam (measured): north end 703.5; center 703.7; south end 704.6.
Top of Dam (Design Plans): 703.5.

(2) Principal Spillway Crest: Design Plans 695.0. (Could not be measured--out in deep water; checked approximately from shore).

(3) Emergency Spillway Crest: Design Plans 697.5; measured 697.6.

(4) Primary Spillway Outlet Pipe Invert: Design Plans 661.7; measured 661.7.

(5) Pool on Date of Inspection: measured 694.2.

(6) Streambed: Design Plans 659.0.

(7) Maximum Tailwater: Unknown.

C. Discharge at Dam Site:

(1) Discharge through the service and emergency spillways is uncontrolled.

(2) Estimated Discharge Capacity at Top of Dam (El. 703.5): 5080 cfs (See Sheet 6, Appendix C).

D. Reservoir Surface Areas:

(1) At Principal Spillway Crest: Larkin & Assoc. Report 184 acres.

(2) At Top of Dam: Larkin & Assoc. Report 256 acres.

E. Storage Capacities:

(1) At Principal Spillway Crest: Larkin & Assoc. Report 2560 acre-ft.

(2) At Top of Dam (El. 703.5): Larkin & Assoc. Report 4400 acre-ft.

F. Reservoir Lengths:

(1) At Principal Spillway Crest (Estimated from Design Plans): 7000 ft.

G. Dam:

(1) Type: Rolled earth.

(2) Length at Crest: 1350 ft.

(3) Height: 44.5 ft.

(4) Top Width: 30 ft.

(5) Side Slopes: 3.0H:1V.

(6) Zoning: Silts and clays in upstream portion; more random materials in downstream portion (Plans and Specifications).

(7) Cutoff: Core trench.

H. Principal Spillway:

(1) Location: South Abutment.

(2) Type: 8 ft by 8 ft concrete riser (30 ft crest length) with a 54 in. diameter reinforced concrete pipe under dam. A minimal number of anti-seep collars were incorporated as shown on Sheet 3 of Appendix A.

I. Emergency Spillway:

(1) Location: North abutment.

(2) Type: Earth and rock cut with 100 ft crest length at concrete control section and 3H:1V side slopes.

SECTION 2 - ENGINEERING DATA

2.1 GENERAL:

Available reports include: an Engineering Study for Proposed Water Supply Improvements by Larkin & Associates, 1964; a letter from the Missouri Geological Survey which includes borings made in 1934 in the dam area; a Financial Study by Larkin and Associates, 1967; borings made by Layne-Western in 1968; and Design Plans and Specifications by Larkin and Associates, 1968. Progress reports for the first year of construction were obtained (do not include any field testing records). There are no documented maintenance and operation data to our knowledge.

2.2 DESIGN:

A. Surveys:

The Design Plans show the topography of the immediate dam site area (Sheet 3 of Appendix A). U.S.G.S. benchmark 3n(1934), which is located approximately 400 ft southwest of the dam, was used to determine embankment elevations (B.M. elev. = 812.42).

B. Geology and Subsurface Materials:

The general geology of the area indicates 5 ft to 10 ft of loess over a thin mantle of glacial till and residual materials in upland areas. Bedrock in the area is the Cabanis Subgroup of the Pennsylvanian System-Desmonesian Series. The Cabanis Subgroup consists of shale, sandstone, limestone and coal beds. A brief description of the geology of the area by the MGS is presented as Sheet 1 of Appendix B. The subsurface profile as encountered by the Missouri Relief and Reconstruction Commission in 1934 is presented as Sheet 2 of Appendix B. The boring location plan from the 1968 Design Plans is included as Sheet 3 of Appendix B. Sheets 4-18 present selected boring logs from the Layne-Western investigation. It should be noted that the Layne-Western soil descriptions do not indicate nearly as much deep sand and gravel deposits as the original 1934 borings.

C. Foundation and Embankment Design:

No design computations are available. The Specifications indicate that borrow material was obtained from the emergency spillway area, the north abutment and the reservoir area. The Specifications indicated that the upstream portion of the embankment would contain clays and silts; the downstream portion could contain more permeable materials (no shale); and the downstream berm could contain random materials which could include shale. The Specifications indicated a

compaction requirement of 95 percent of the Standard Proctor dry density. The design also includes a drainage blanket and a shallow core trench (see Sheet 3 of Appendix A). No construction test data were obtained.

D. Hydrology and Hydraulics:

The basic hydrologic information for this lake is contained in an "Addendum to Engineering Study" by Larkin and Associates, 1964. It should be noted that the total drainage area of both the upper lake (not a part of this inspection study) and Rogers Lake was indicated to be 1850 acres in the Larkin report. Our estimate of the drainage area from the U.S.G.S. quad sheet is 2510 acres, which was used in our analysis. The drainage areas of the upper lake and Rogers Lake are estimated to be approximately 1250 acres and 1260 acres, respectively. The storage information from the Larkin report was used (see Sheet 17 of Appendix B). Appendix C contains our overtopping analysis. It was concluded that the primary and emergency spillways combined will pass 73 percent of the Probable Maximum Flood.

E. Structure:

Structural design computations for appurtenant structures were not obtained. Details of the spillway and water supply intake structures are shown on the Design Plans (see Sheet 4 of Appendix A).

2.3 CONSTRUCTION:

No construction test data have been obtained. The construction of the dam was under the inspection of a city employee who reported to the engineer. Progress reports were submitted on a weekly basis.

2.4 OPERATION AND MAINTENANCE:

We have no information regarding the daily water consumption from this water supply lake. The appearance of the dam indicates that it is regularly mowed and brush is removed.

2.5 EVALUATION:

The available engineering data listed in Section 2.1 do not include seepage or stability analyses nor any construction test data, and thus were inadequate to make a detailed assessment of the design, construction and operation. No valid engineering data on design or construction of the embankment were found.

SECTION 3 - VISUAL INSPECTION

3.1 GENERAL:

The field inspection was made on 15 September 1978. The inspection team consisted of personnel from Anderson Engineering, Inc. of Springfield, Missouri and Hanson Engineers, Inc. of Springfield, Illinois. The team members were:

Bruce Rhodes - Anderson Engineering (Civil Engineer)
Steve Brady - Anderson Engineering (Civil Engineer)
Jack Healy - Hanson Engineers (Geotechnical and Structural Engineer)
Gene Wertepny - Hanson Engineers (Hydraulics Engineer)

3.2 DAM:

The dam is an earth fill embankment constructed from borrow obtained from the emergency spillway area, the north abutment and the north shoreline upstream of the dam (borrow areas indicated by the Plans and Specifications). Based on the soil borings, the fill material would be expected to consist of clays and silts and possibly some granular materials.

The embankment appeared to be in generally good condition except for several erosion gullies below and draining the downstream berm. A 5 ft to 6 ft erosion gully has also developed at the south abutment immediately south of the primary spillway outlet (See photograph, Sheet 4 of Appendix D). No animal burrows were noted.

No sloughing of the embankment or seepage through or under the embankment was evident. The drain pipe for the drainage blanket could not be found and may have been damaged and covered by past mowing and maintenance equipment. The floodplain below the dam was green and moist. However, a rainstorm in the area about one hour before our site visit may account for the moist condition.

The horizontal alignment appeared as constructed. No surface cracking or unusual movement was obvious. The riprap on the embankment appeared to be in good condition. Some sloughing and shore erosion was noted along the shoreline (natural material) between the north end of the dam and the emergency spillway. This section was not riprapped.

No instrumentation (monuments, piezometers, etc.) was observed.

A. Primary Spillway and Outlet:

The riser structure could not be directly inspected since it is in the water. Visual inspection from the dam did not indicate any apparent problems. The outlet pipe and stilling basin structure are in good condition. Considerable erosion has taken place at the end of the stilling basin structure. Riprap has been carried away, and some of it is piled in the center of the outlet channel (see picture - Sheet 3 of Appendix D). The outlet channel is in fairly good condition downstream of this area.

B. Emergency Spillway:

The emergency spillway is in good condition. It measures 100 ft in width at the concrete sill control section with 3h:1V side slopes. Information from a local source indicates that it may have been used once. The emergency spillway is not lined but is partially cut in rock. Some erosional damage would be incurred during full flow, but the damage would not be expected to be catastrophic and would be repairable.

3.3 RESERVOIR AND WATERSHED:

The immediate periphery of the lake was grass covered and wooded with moderate slopes. No sloughing of the reservoir banks was noted except for the section previously mentioned between the north end of the dam and the emergency spillway.

3.4 EVALUATION:

The erosion which was noted on the slope below the downstream berm and especially on the south abutment and at the end of the sill block at the primary spillway outlet should be corrected and maintained. The south abutment erosional area should be regraded, and an effort should be made to minimize future erosion. The erosional area at the end of the sill block should be corrected immediately and maintained.

The shoreline between the north end of the dam and the emergency spillway may need riprap in the future to prevent further sloughing. The drainage blanket outlet pipe should be located, repaired if necessary, and marked to prevent future damage by maintenance equipment. Free drainage of the drainage blanket is important to avoid possible piping or stability problems in the future.

The raw water pipe between the primary spillway and water supply structure and the pump station would appear to be under pressure much of the time (see Sheets 3 & 4 of

Appendix A). The area around the pipe outlet should be periodically inspected for seepage which might indicate a leak or rupture of the drain pipe. Such leakage could eventually initiate a piping failure through the embankment.

It should be noted also that the original raw water pipe from the upper reservoir was removed when the dam was built. Its removal and the subsequent replacement of soil material would have been a critical operation. We have no information on how this was done.

Photographs of the dam, appurtenant structures, and the reservoir and watershed are presented in Appendix D.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES:

Flow over the primary and emergency spillway crests is uncontrolled. The water level in the lake could be lowered by means of the low level intake upstream of the primary spillway (see Sheets 3 and 4 of Appendix A). Water supply can apparently be obtained by means of either the low level intake or the upper movable intake pipe in combination with the booster pump station on the downstream side of the dam. We have no information regarding water supply regulating procedures.

4.2 MAINTENANCE OF DAM:

Based on the appearance of the dam, it is obviously mowed on a regular basis. The erosional areas which were noted apparently do not receive any regular repair.

4.3 MAINTENANCE OF OPERATING FACILITIES:

We have no information regarding maintenance of the water supply facilities.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT:

The inspection team is unaware of any existing warning system for this dam.

4.5 EVALUATION:

Erosional areas should be corrected and maintained as discussed in Section 3.4. The outlet pipe for the drainage blanket should be located, repaired and marked. The shoreline between the north end of the dam and the emergency spillway may need to be protected from wave erosion in the future. The outlet channel has some brush, which should be removed.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES:

A. Design and Experience Data:

The basic hydrologic information for this lake is contained in an "Addendum to Engineering Study" by Larkin and Associates, 1964. It should be noted that the total drainage area of both the upper lake (not a part of this inspection study) and Rogers Lake was indicated to be 1850 acres in the Larkin report. Our estimate of the drainage area from the U.S.G.S. quad sheet is 2510 acres, which was used in our analysis. The drainage areas of the upper lake and Rogers Lake are estimated to be 1250 acres and 1260 acres, respectively. The storage information from the Larkin report was used (see Sheet 17 of Appendix B). Appendix C contains our overtopping analysis, which is based on U.S. Army Corps of Engineers guidelines.

B. Visual Observations:

The primary spillway and water supply structure could not be inspected since it was in the water. The outlet pipe and stilling basin are in good condition except for the erosion at the end of the sill block. This condition should be corrected as discussed in Section 3.4 to prevent possible undermining and damage to the outlet structure. The emergency spillway is in good condition and, according to a local resident, may have been used once.

Facilities are available to draw down the pool. Spillway releases would not be expected to endanger the integrity of the dam, provided the erosional areas in the primary spillway outlet area are corrected.

C. Overtopping Potential:

Based on the hydrologic and hydraulic analysis as presented in Appendix C, the combined primary and emergency spillways will pass 73 percent of the Probable Maximum Flood. The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The recommended guidelines from the Department of the Army, Office of the Chief of Engineers, require that this structure (intermediate size with high downstream hazard potential) pass 100 percent of the PMF, without overtopping. One hundred percent of the PMF will overtop the dam by 1.47 ft for a duration of 2.83 hours with a resultant peak outflow discharge of 14,388 c.f.s. (see Sheet 6 of Appendix C). The combined spillways will pass the 100 year frequency flood without overtopping.

The hydrologic and hydraulic effects of the upstream Fayette Lake Dam have not been addressed in this report. It is believed that results of these analyses are conservative with respect to percent PMF passed by Rogers Dam. The upstream dam will be inspected later in the National Program of Inspection of Non-Federal Dams and, at that time, the Rogers Dam overtopping analyses will be revised.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY:

A. Visual Observations:

Visual observations which could adversely affect the structural stability of this dam are discussed in Sections 3.2 and 3.4. If left unchecked, the erosion on the dam, at the south abutment, could cause stability problems in the future. The erosion at the end of the primary spillway sill block, if not corrected, could undermine the foundation of the spillway and damage the structure. The sloughing along the shoreline between the north end of the dam may need to be protected from wave erosion in the future.

B. Design and Construction Data:

Design plans were prepared by Larkin and Associates. The pertinent sheets from these plans are presented as Sheets 2 through 5 of Appendix A. Our site inspection indicated that the side slopes and berm widths were as recommended. If the embankment was placed in relatively thin lifts at the recommended density of 95 percent of the Standard Proctor maximum dry density (no laboratory testing records available to verify this), then the embankment should remain stable. No stability or seepage analyses nor any construction test data were found.

C. Operating Records:

No operating records have been obtained.

D. Post-Construction Changes:

To our knowledge, no post-construction changes have been made.

E. Seismic Stability:

The structure is located in seismic zone 1, which is historically the least active zone in terms of occurrence and magnitude of earthquakes. The seismic loading prescribed for zone 1 is generally not critical for a well-constructed earth dam of this size.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT:

A. General:

This Phase I inspection and evaluation should not be considered as being comprehensive since the scope of work contracted for is far less detailed than would be required for an in-depth evaluation of dams. Latent deficiencies, which might be detected by a totally comprehensive investigation, could exist.

B. Safety:

The embankment is generally in good condition. Several items were noted during the visual inspection which should be corrected or controlled. These items are: (1) erosion at the end of the primary spillway stilling basin; (2) erosion on the slope below the downstream berm; (3) erosion gullies on the south abutment; (4) the drainage blanket outlet pipe could not be found; and (5) sloughing of the shoreline between the north end of the dam and the emergency spillway.

The dam will be overtopped by flows in excess of 73 percent of the Probable Maximum Flood. Overtopping of an earthen embankment could cause serious erosion and could possibly lead to failure of the structure.

C. Adequacy of Information:

The conclusions in this report were based on review of the information listed in Section 2.1, the performance history as related by others, and visual observation of external conditions. The inspection team considers that these data are sufficient to support the conclusions herein. Seepage and stability analyses comparable to the "Recommended Guidelines for Safety Inspection of Dams" were not available. This is a deficiency which should be rectified.

D. Urgency:

The remedial measures recommended in paragraph 7.2 should be accomplished in the near future. If these items are not corrected, and if good maintenance is not provided, then damage to the spillway outlet structure could result, and the embankment condition will continue to deteriorate and will become serious in the future.

E. Necessity for Phase II:

Based on the result of the Phase I inspection, no Phase II inspection is recommended.

F. Seismic Stability:

The structure is located in seismic zone 1, which is historically the least active zone in terms of occurrence and magnitude of earthquakes. The seismic loading prescribed for zone 1 is generally not critical for a well-constructed earth dam of this size.

7.2 REMEDIAL MEASURES:

The following remedial measures and maintenance procedures are recommended. All remedial measures should be performed under the guidance of a professional engineer experienced in the design and construction of dams.

(1) Seepage and stability analyses comparable to the requirements of the recommended guidelines should be performed by an engineer experienced in the construction of dams.

(2) The erosion which was noted at the end of the sill block at the primary spillway outlet should be corrected immediately and maintained.

(3) The erosion which was noted on the slope below the downstream berm and on the south abutment should also be corrected in the near future and maintained. Possibly, future erosion can be minimized with the use of riprap or ditch checks.

(4) The shoreline between the north end of the dam and the emergency spillway may need wave erosion protection in the future to prevent further sloughing.

(5) The drainage blanket outlet pipe should be located, repaired and marked to prevent future damage by maintenance equipment.

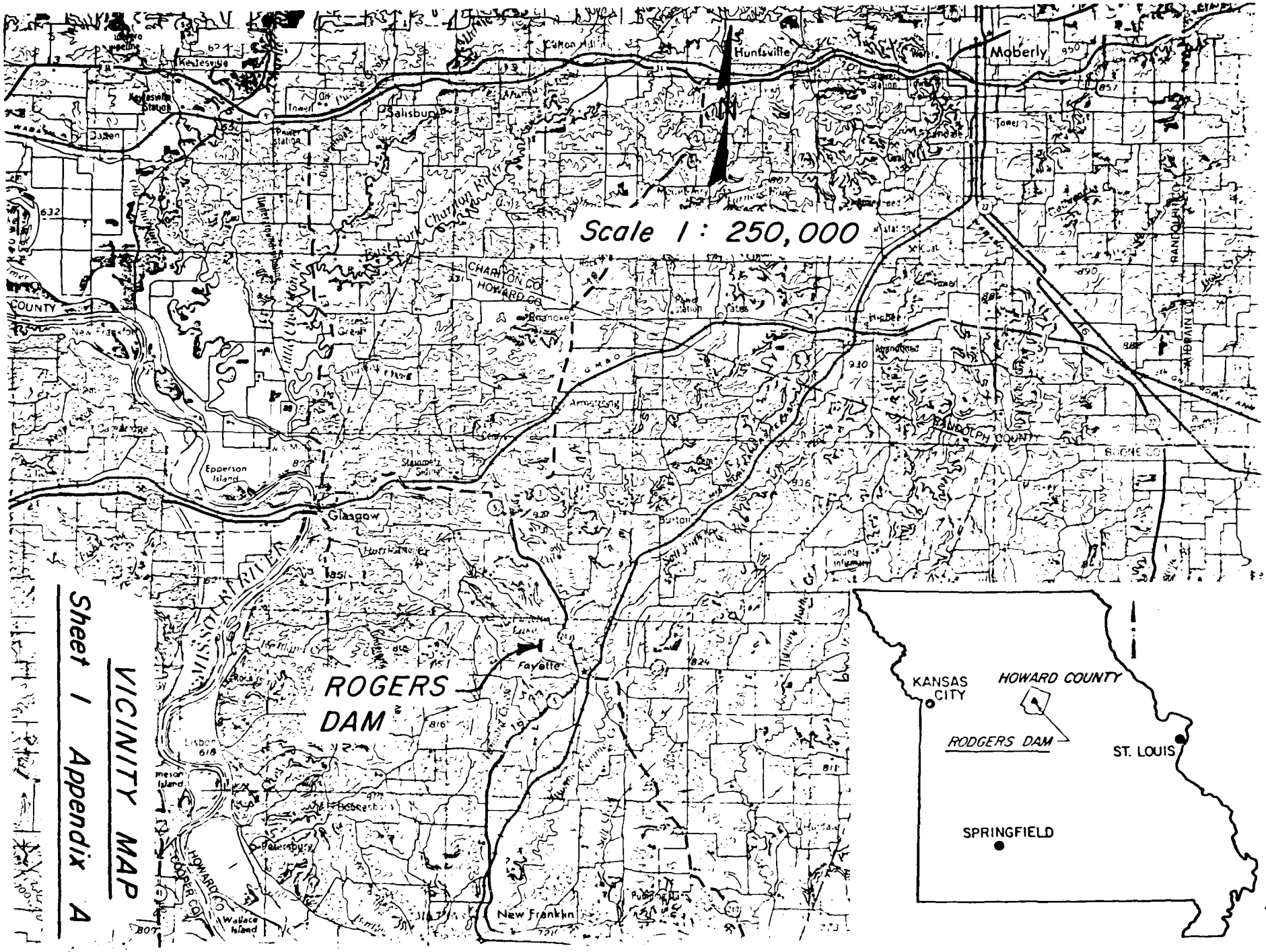
(6) Check the downstream slope periodically for seepage and stability problems (especially in the area of the raw water pipe under the dam). If wet areas or seepage flows are observed, or if sloughing is noted, then the dam should be inspected immediately and the situation evaluated by an engineer experienced in design and construction of dams. The area around the raw water pipe egress should be inspected periodically and if significant seepage and the beginning of erosion around the pipe are found, the situation should be evaluated by a geotechnical engineer.

(7) A detailed inspection of the dam should be made at least every 5 years by an engineer experienced in the design and construction of dams. More frequent inspections may be required if slides, seeps, or other items of distress are observed.

(8) Spillway size and/or height of dam should be increased to pass the PMF. In either case, the spillway should be protected to prevent erosion. Permanent lowering of the pool elevation is also a possibility in passing the PMF.

(9) Seepage and stability analyses comparable to the requirements of the guidelines were not available, which is considered a deficiency and should be corrected.

APPENDIX A



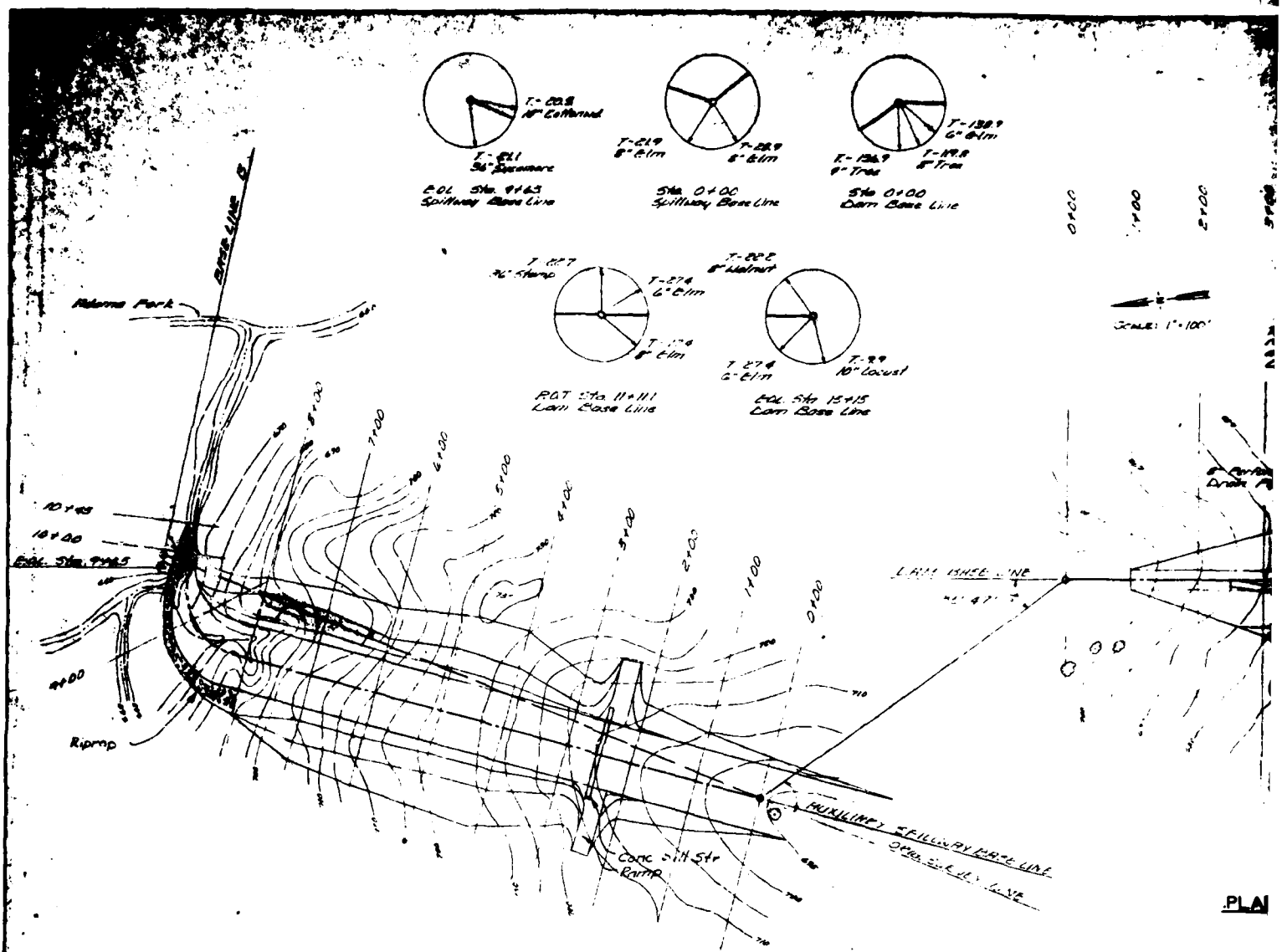
VICINITY MAP

Sheet 1 Appendix A

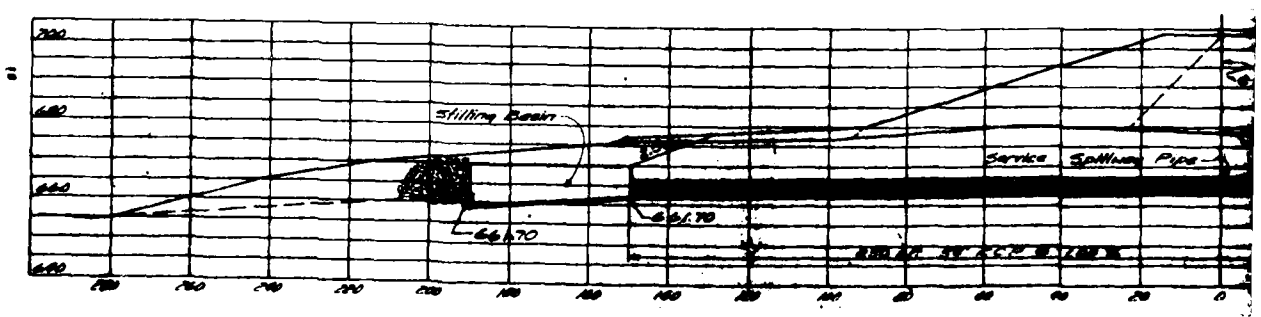

WATER
LEVEL
EL. 6

Sheet 2 Appendix A

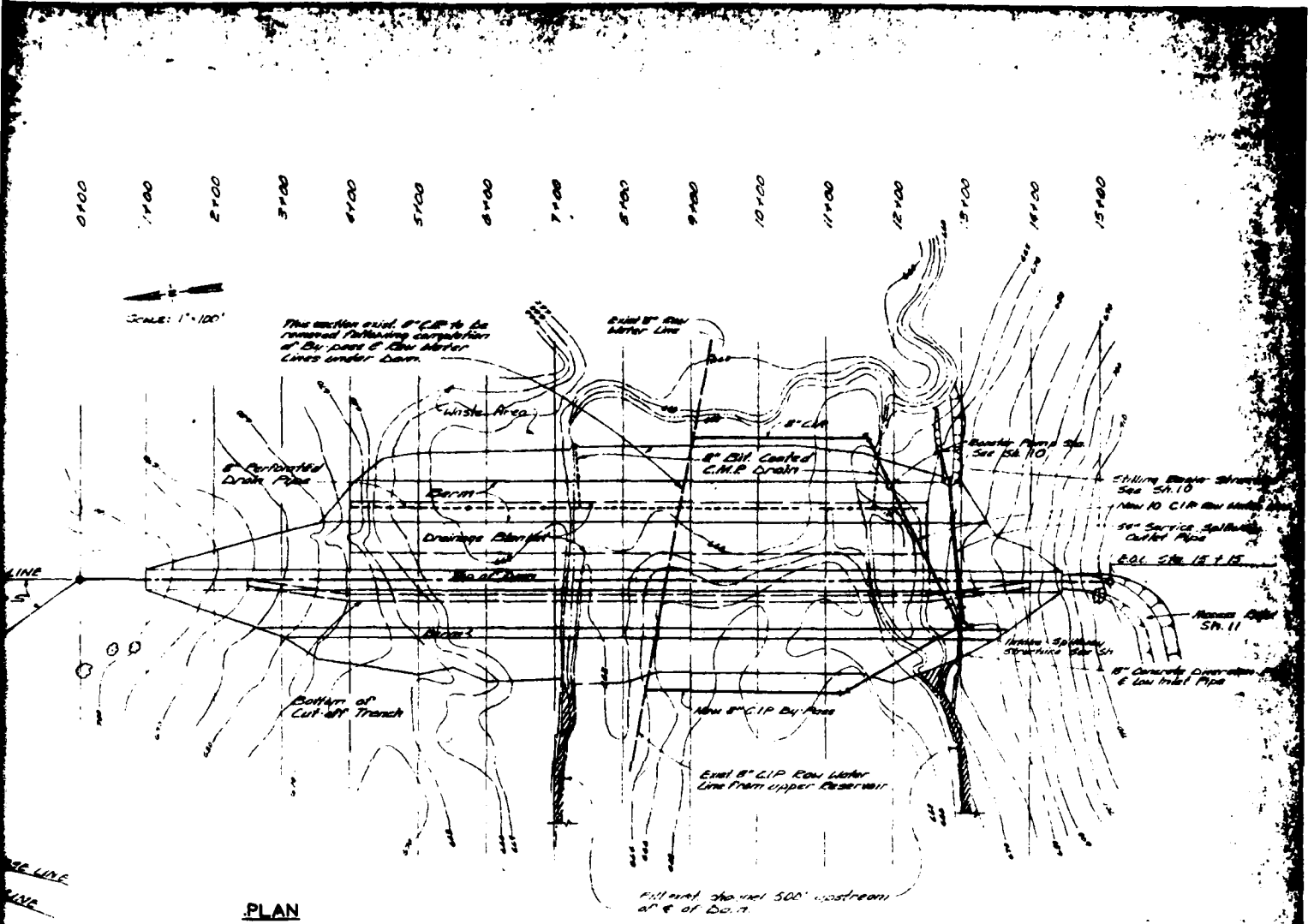
LARKIN & ASSOCIATES
Consulting Engineers

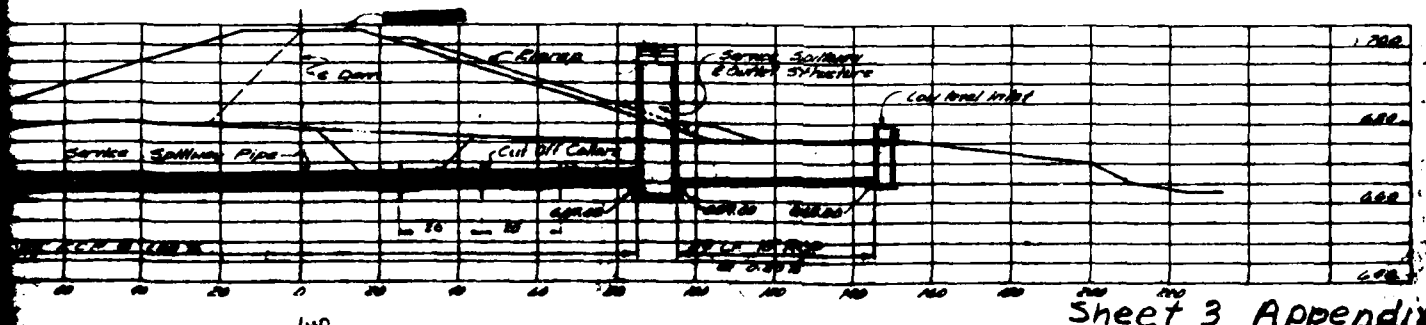


PLAN



PROFILE THRU OUTLET



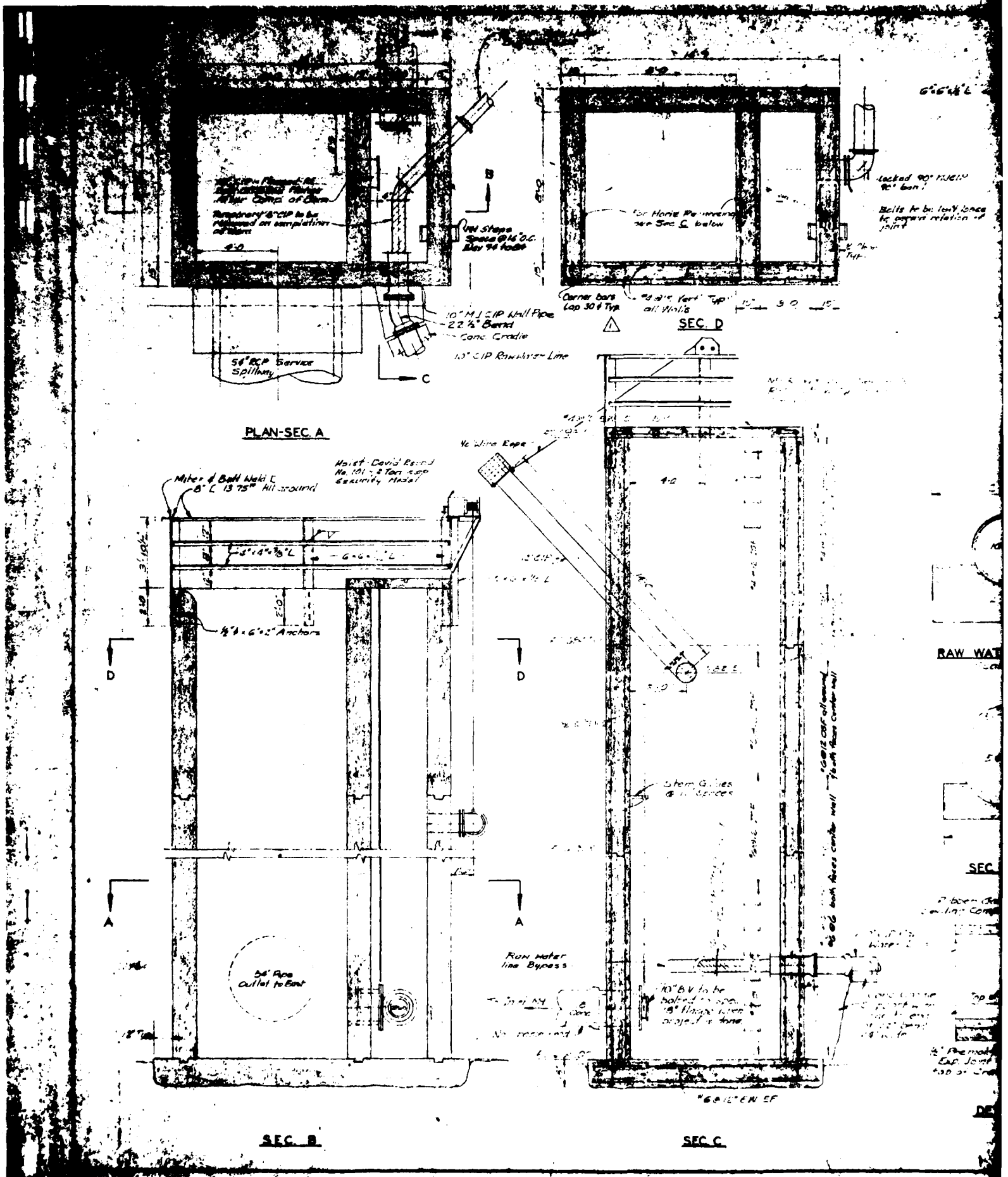


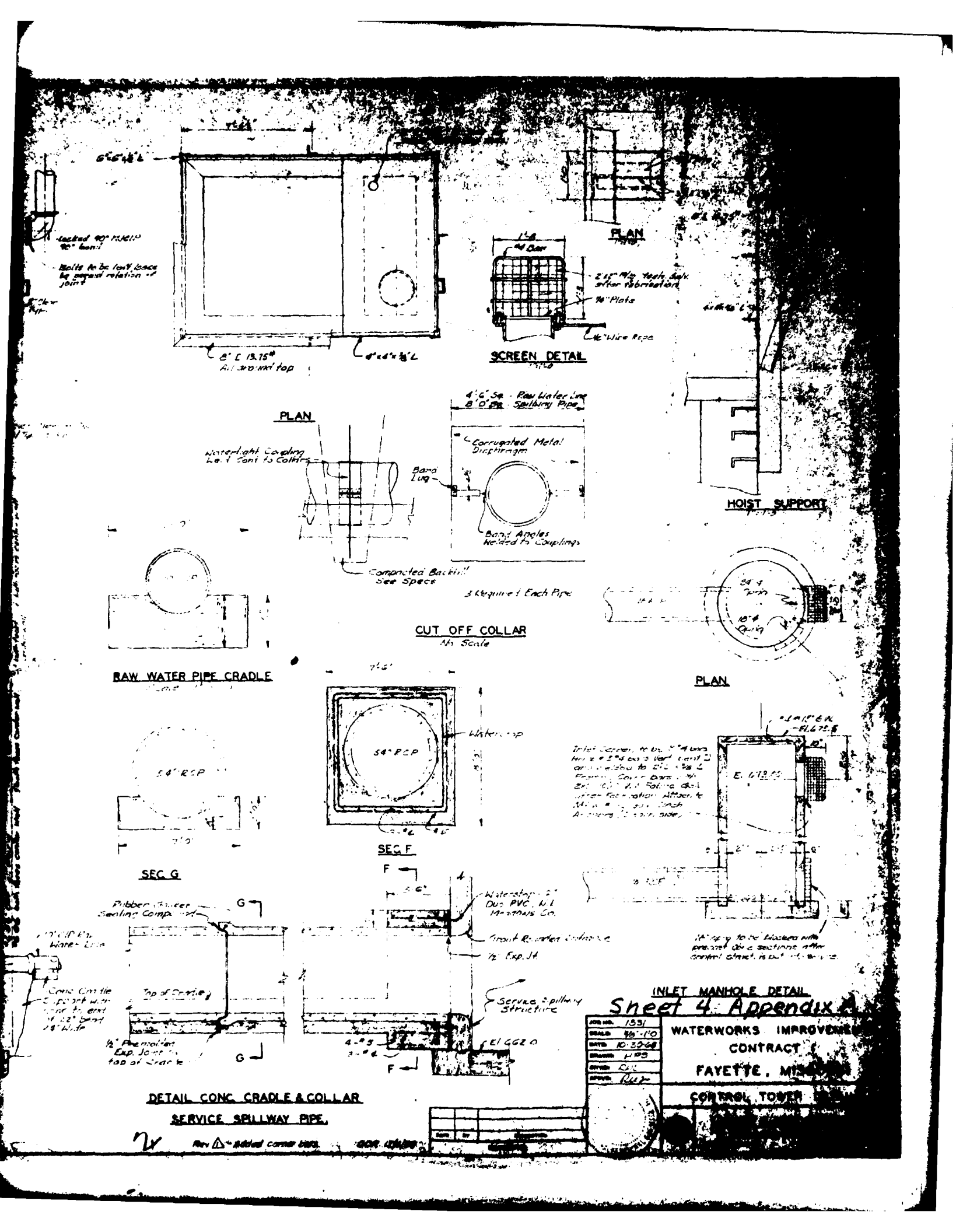
PROFILE THRU OUTLET STRUCTURE

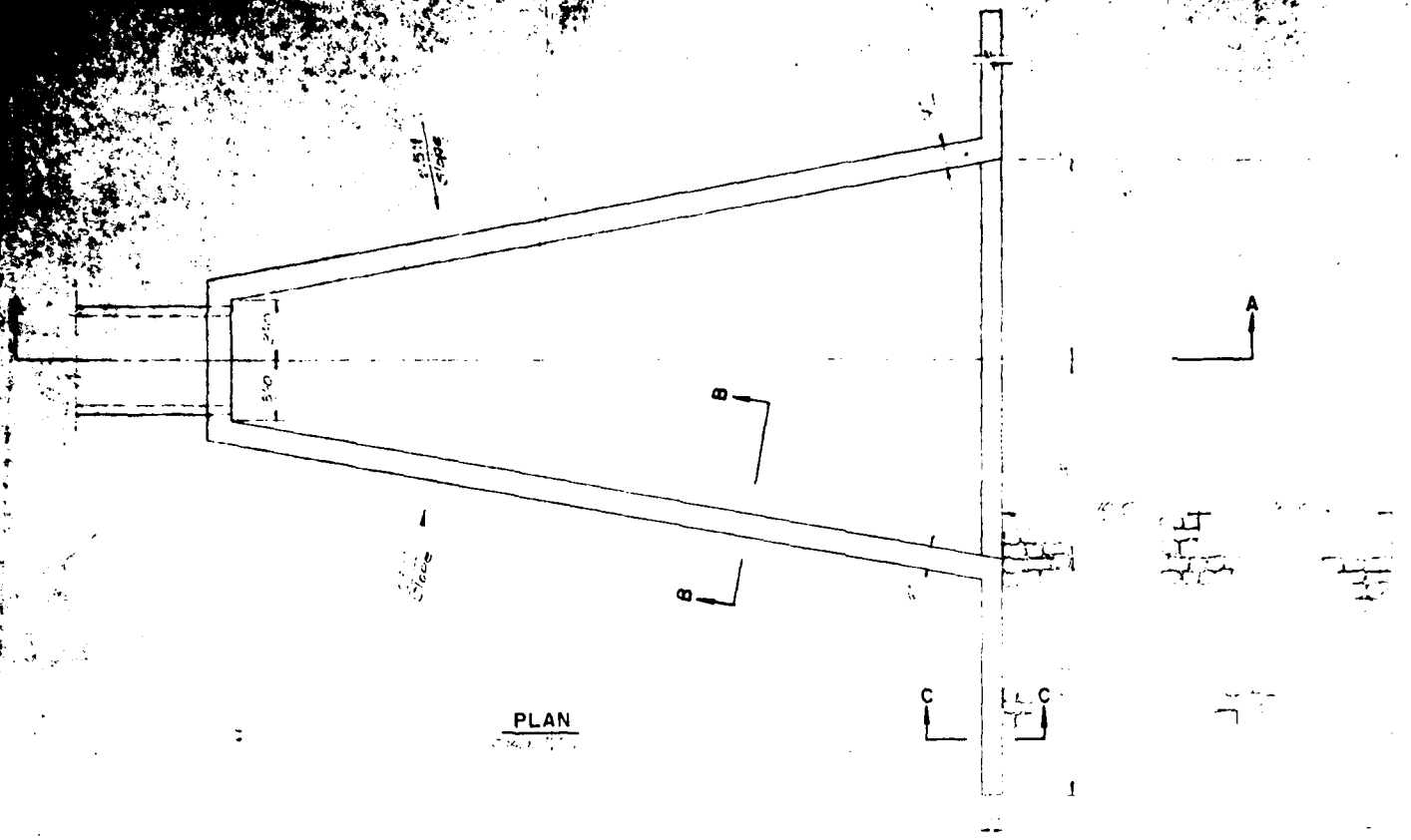
Sheet 3 Appendix

Date	1831
Drawn	As Shown
Date	6-20-68
Traced	KMC
Date	BWL
Checked	

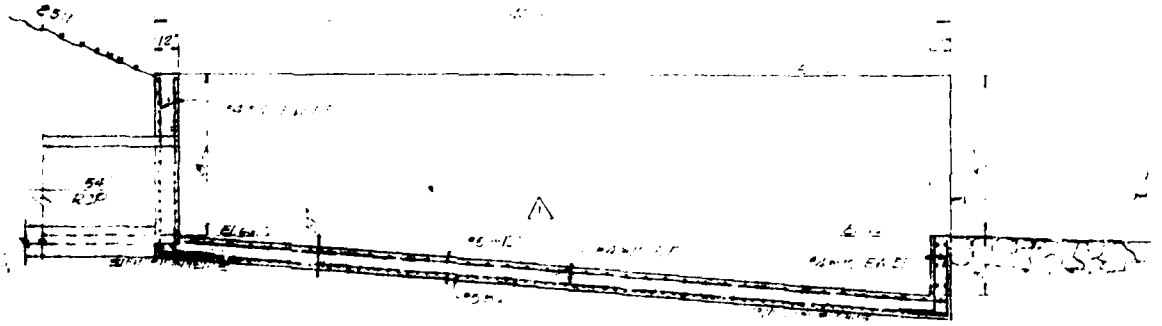
WATERWORKS IMPROVEMENT
CONTRACT I
FAYETTE, MISSISSIPPI
PLAN OF DAM & SPILLWAY


PLAN-SEC A
SEC. B
SEC. C
SEC. D
Corner bars Lap 30 ϕ Typ.
"d" o/c Vert. Typ. all Walls
10" M.J. CIP Wall Pipe
22½° Bend
Conc. Cradle
10" CIP Raw Water Line
54" RCP Service Spillway
Weir Steps Space @ 16" O.C. Elev. 94 to 88
Reinforcing & CIP to be removed on completion of Work
Miter & Butt Weld to 8" C 13.75# All around
Hoist: Coastal Rental No. 101 - 2 Ton cap. Gearing Model
½" Wire Rope
½" ϕ x 6'-2" Anchors
34" Pipe Outlet to Boat
Raw Water line Bypass
10" BV to be bolted to pipe with 9" flange by others
Stem Guides @ 11'-0" Centers
RAW WAT
SEC

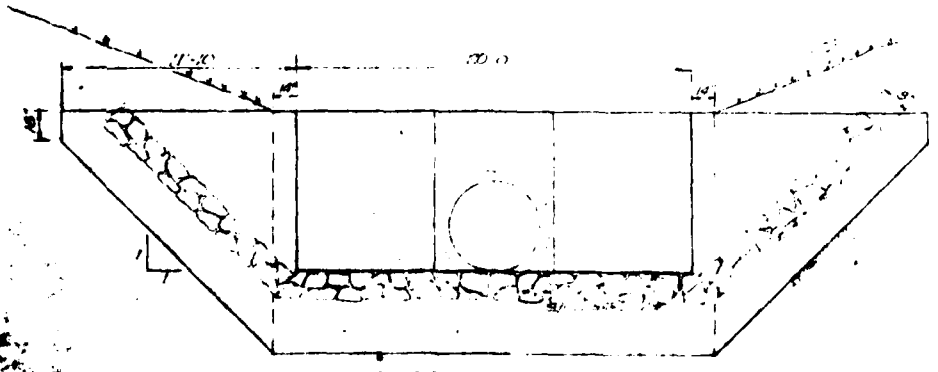

PLAN
SCREEN DETAIL
PLAN
HOIST SUPPORT
CUT OFF COLLAR
No Scale
RAW WATER PIPE CRADLE
PLAN
SEC F
SEC G
INLET MANHOLE DETAIL
DETAIL CONC. CRADLE & COLLAR
SERVICE SPILLWAY PIPE.
Sheet 4 Appendix A
WATERWORKS IMPROVEMENTS
CONTRACT
FAYETTE, MISS.
CONTROL TOWER



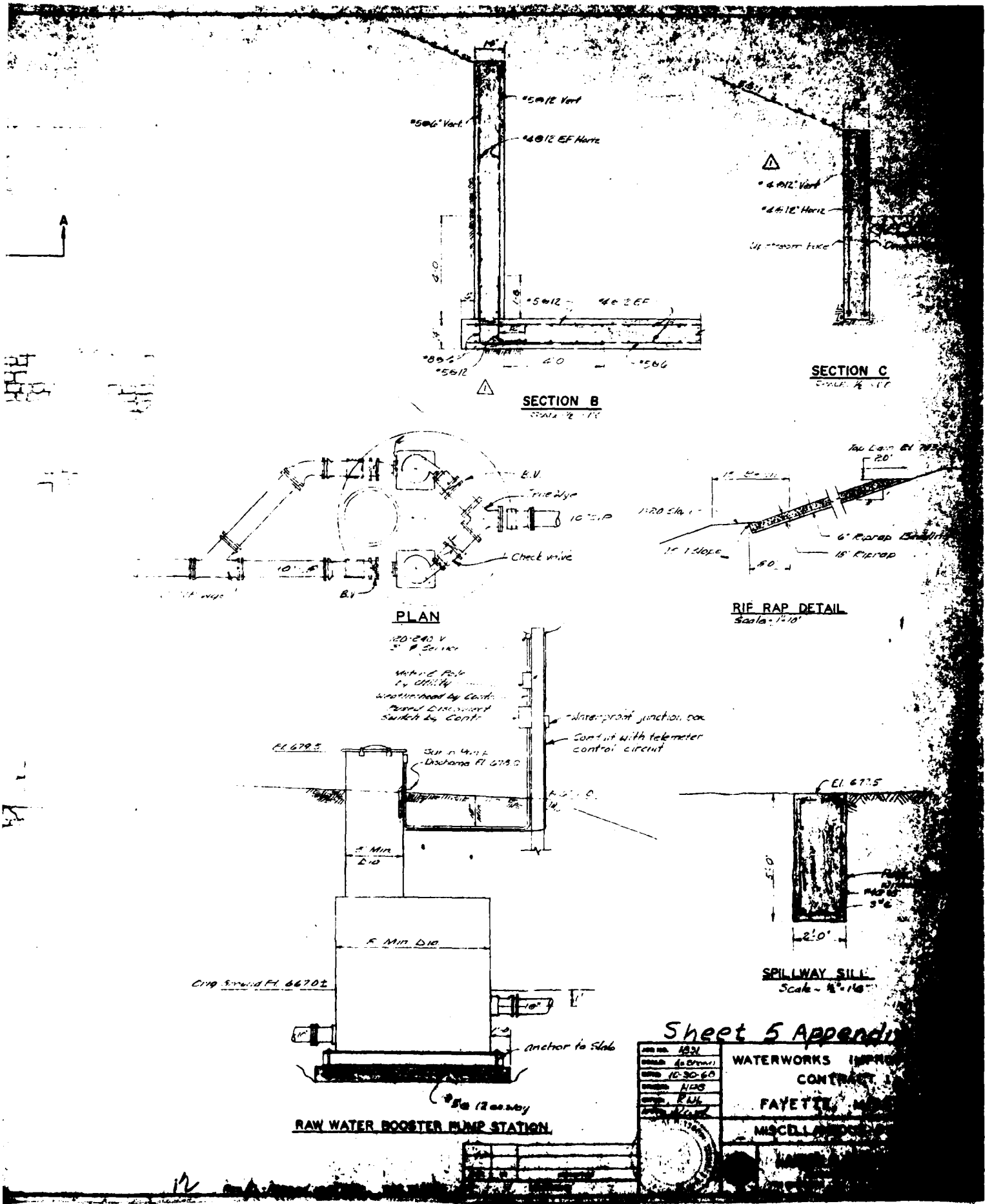
PLAN



SECTION A



EAST ELEVATION
STILLING BASIN


#5@12 Vert
#5@6' Vert
#4@12 EF Horiz
#5@12
#4@12 EF
4'-0"
#5@12
#5@6
SECTION B
#4@12' Vert
#4@12' Horiz
SECTION C
B.V.
Tee Wye
10" S.I.P
Check valve
B.V
PLAN
Top Elev. El 703
2'-0"
1:20 Slope
6" Riprap
15" Riprap
1:1 Slope
5'-0"
RIP RAP DETAIL
Scale: 1"=10'
120-240 V
Water Proof junction box
Control with telemeter control circuit
El 679.5
Discharge El 679.0
5' Min Dia
Conc Ground El 667.0±
anchor to Slab
#5@ 12 each way
RAW WATER BOOSTER PUMP STATION
El 677.5
5'-0"
3'-6"
2'-0"
SPILLWAY SILL
Scale - 1"=1'-0"
Sheet 5 Appendi
WATERWORKS
CONTRACT
FAYETT
MISCELLA

APPENDIX B

Lake City of Fayo
Howard Co

[illegible] - phone co

September 30, 1964

Mr. Robert Lamberton
Larkin and Associates
19 East Gregory
Kansas City, Missouri

Dear Bob:

Enclosed are two (2) copies of the drilling done in 1934 for the proposed Fayette dam in sections 10 and 3, T. 50 N., R. 16 W., Howard County and a Lafayette 7½-minute topographic quadrangle. I have roughed in the section of rock which will probably be encountered on the abutments. The total thickness of the Lagonda shale, which may contain some sandstone beds, and the position of the Bevier-Wheeler coal, Ardmore limestone and shale (Verdigris formation) and Croweburg coal are estimated. The major outcropping units in the proposed reservoir area are from the Higginsville limestone to the upper part of the Lagonda shale.

The approximate Fort Scott-Cabaniss contact, drawn at the top of the Excello, black slaty shale, is shown on the topographic map. This was taken from a Master's thesis map by Rudy Prusok.

The major seepage zones that we have noted at dams constructed in the Pennsylvanian system of rocks are, in addition to jointed limestones, associated with joints in the black, fissile or slaty shales and coals which are underlain by impervious underclay.

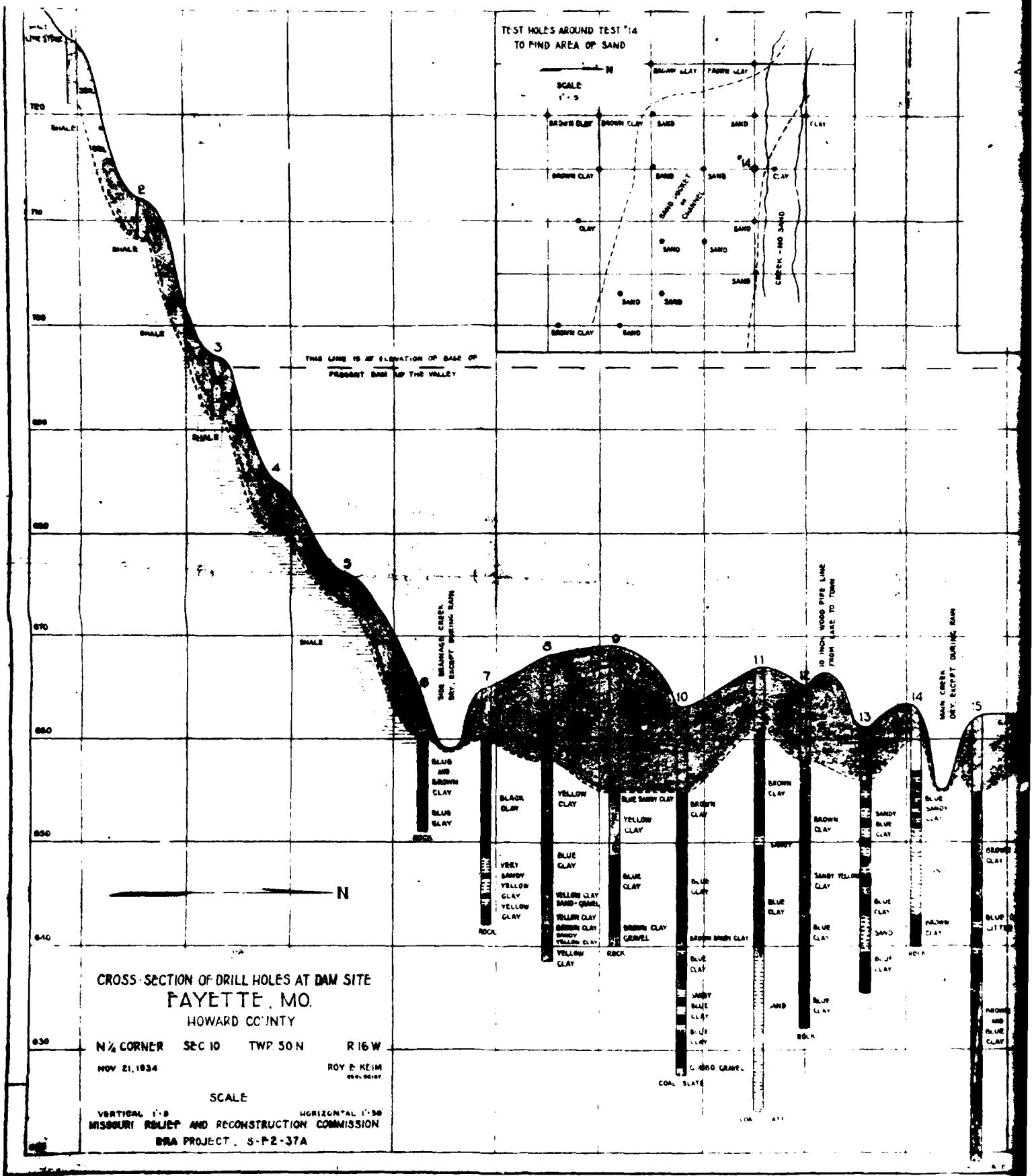
Williams and I would appreciate hearing from you when the construction begins and especially when the core trench is opened.

Yours truly,

James A. Martin
Geologist

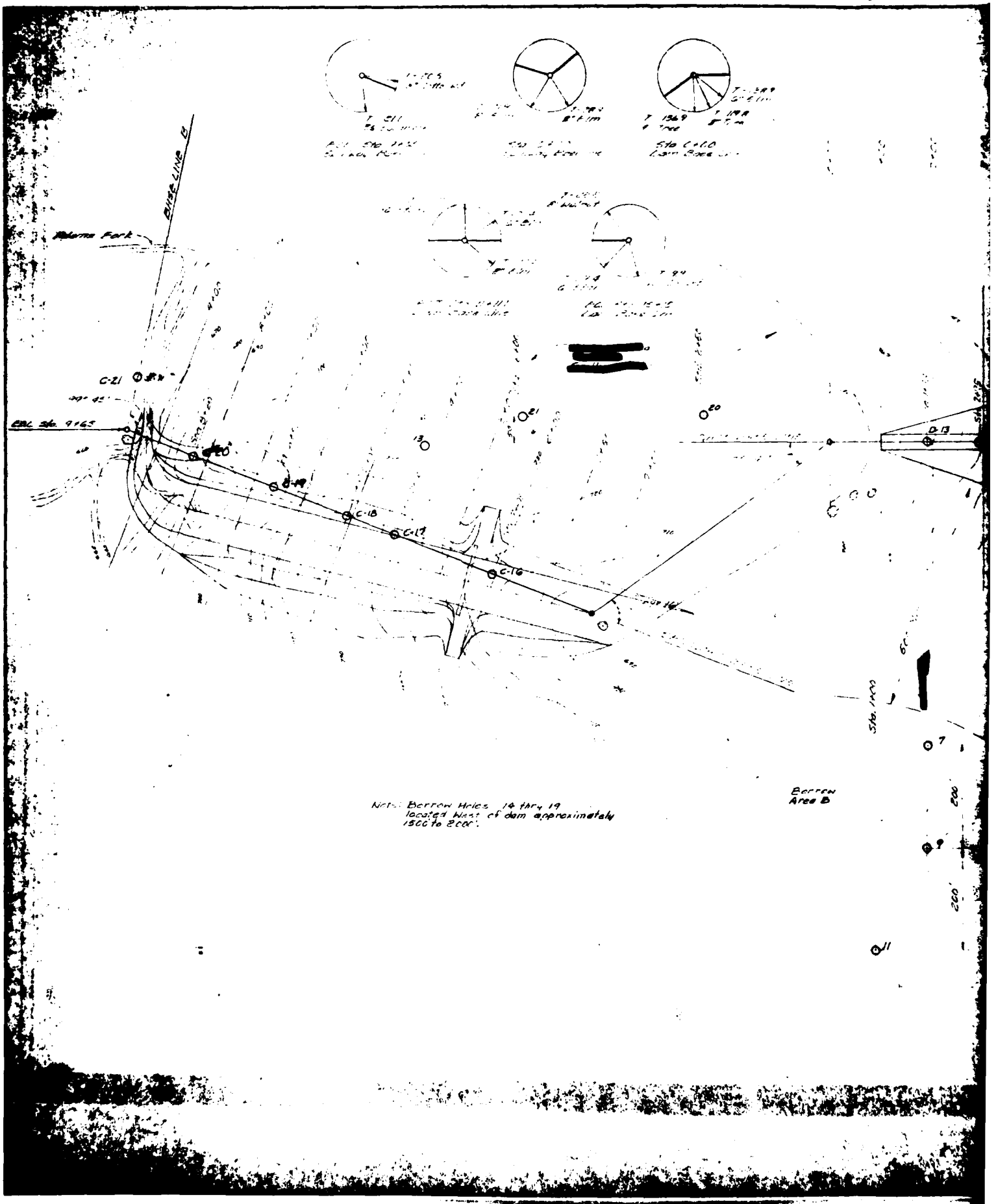
JAM:blh

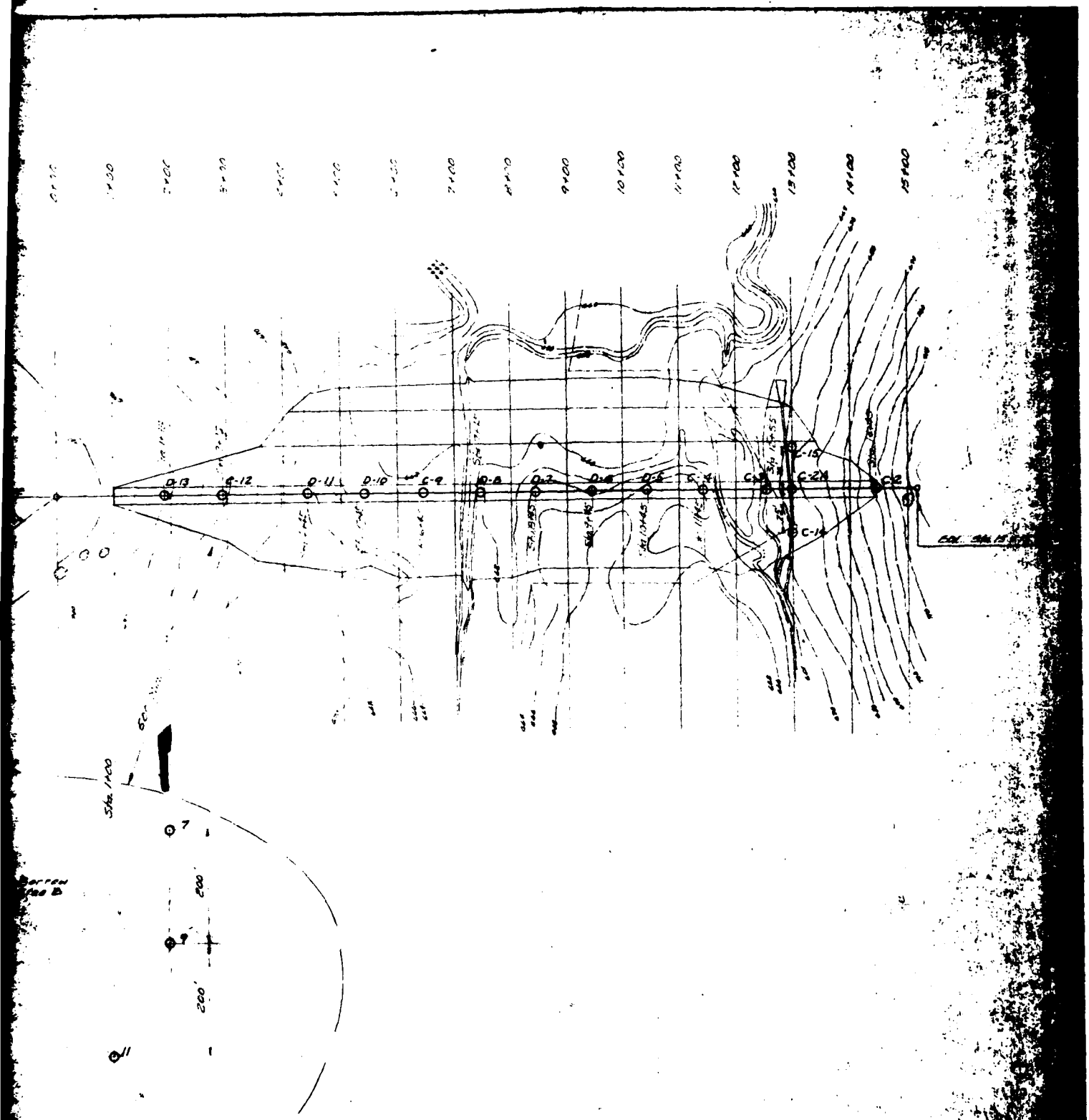
Sheet 1 Appendix B


TEST HOLES AROUND TEST #14
TO FIND AREA OF SAND
SCALE
1" = 5
N
BROWN CLAY
SAND
CLAY
SAND MIXED WITH GRAVEL
CREEK - NO SAND
THIS LINE IS AT ELEVATION OF BASE OF
PRESENT DAM UP THE VALLEY
SHALE
SIDE DRAINAGE CREEK DRY, EXCEPT DURING RAIN
MAIN CREEK DRY, EXCEPT DURING RAIN
10 INCH WOOD PIPE LINE FROM LAKE TO TOWN
BLUE AND BROWN CLAY
BLUE CLAY
BLACK CLAY
YELLOW CLAY
BLUE SANDY CLAY
BROWN CLAY
VERY SANDY YELLOW CLAY
YELLOW CLAY
BLUE CLAY
YELLOW CLAY SAND - GRAVEL
BROWN CLAY GRAVEL
ROCK
BROWN SANDY CLAY
SANDY BLUE CLAY
SANDY YELLOW CLAY
COAL SLATE
N
CROSS-SECTION OF DRILL HOLES AT DAM SITE
FAYETTE, MO.
HOWARD COUNTY
N ¼ CORNER SEC 10 TWP 50 N R 16 W
NOV 21, 1934
ROY E KEIM
SCALE
VERTICAL 1" = 5 HORIZONTAL 1" = 50
MISSOURI RELIEF AND RECONSTRUCTION COMMISSION
ERA PROJECT, S-P2-37A

Sheet 2 Appendix B

324-10-3


Miami Fork
C-21
C-20
C-19
C-18
C-17
C-16
D-13
Note: Borrow Holes 14 thru 19
located West of dam approximately
1500 to 2000'.
Borrow
Area B



Sheet 3 Append

WATERWORKS IM

CONTRAC

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. 703.0 RIG CME

DATE 5-14-68 BORING NO. C-2

CONTRACT City of Fayette

ADDRESS Dam Site 14+45 ℄ Dam

CITY AND STATE Fayette, Missouri

WATER LEVEL _____ CASING USED Hollow Augers

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; R.B.—Rock Bit; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Shear Vane; C.W.—Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD Hydraulic Pressure	PENETRATION RECORD Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
0'0"	3'6"	AO				Gray yellow weathered shale, dry, hard
3'6"	5'0"	ST1	4.50+		15"	Gray yellow weathered shale, dry, hard
5'0"	8'6"	AO				Gray yellow weathered shale, dry, hard
8'6"	9'6"	ST2	4.50+		12"	Gray shale, dry, hard
9'6"	10'0"	AO				Brown shale, dry, hard
10'0"	17'6"	CW			88-1/2"	Gray sandy shale, hard, 16 pcs. 1/2" to 29"
17'6"	27'6"	CW			120"	Gray shale, hard, 9 pcs. 1" to 38"
27'6"	37'6"	CW			120"	Gray shale, hard, 14 pcs. 1" to 29"
37'6"	45'8"	CW			98"	Gray shale, hard, 21 pcs. 2" to 29"
45'8"	47'6"	CW			22"	Black coal, hard, 4 pcs. & crumbled
47'6"	48'6"	CW			12"	Gray shale, 4 pcs. & crumbled 1" to 5"
48'6"	50'0"	CW			18"	Gray shale with limestone nodules, 5 pcs. 1/2" to 7"
50'0"	60'0"	CW			117"	Gray shale with limestone nodules, 31 pcs. 1/2" to 17"
60'0"	Total Depth					

DRILLER TO INDICATE:

TIME AND DATE HOLE COMPLETED 10 A.M. 5-15-68

TIME AND DATE WATER LEVEL RECORDED _____

Sheet 4 Appendix B

3270 10M 1-68

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. EJ 665.9 RIG CME

DATE 5-15-68 BORING NO. C-4

CONTRACT City of Fayette

ADDRESS Dam Site 11+45 & Dam

CITY AND STATE Fayette, Missouri

WATER LEVEL _____ CASING USED Hollow Augers

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; P.B.—Rock Bit; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Shear Vane; C.W.—Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD Hydraulic Pressure	PENETRATION RECORD Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
0'0"	3'6"	AO				Brown gray clayey silt, moist, stiff
3'6"	5'0"	ST1	1.50		18"	Brown gray clayey silt, moist, stiff
5'0"	8'6"	AO				Brown gray clayey silt, moist, stiff
8'6"	10'0"	ST2	.25		16"	Brown gray clayey silt, moist, soft
10'0"	13'6"	AO				Brown gray clayey silt, moist, soft
13'6"	15'0"	ST3	1.00		18"	Gray brown clayey silt, moist, stiff
15'0"	16'0"	AO				Gray brown clayey silt, moist, stiff
16'0"	18'6"	AO				Gray brown sandy clayey silt, trace gravel, moist, stiff
18'6"	20'0"	ST4	.50		18"	Gray brown sandy clayey silt, trace gravel, moist, med.
20'0"	23'6"	AO				Gray brown sandy clayey silt, trace gravel, moist, med.
23'6"	25'0"	ST5	4.50+		18"	Gray brown sandy clayey silt, trace gravel, moist, hard
25'0"	27'0"	AO				Gray brown sandy clayey silt, trace gravel moist, hard
27'0"	28'6"	AO				Dark gray shale, dry, hard
28'6"	29'6"	ST6	4.50+		12"	Dark gray shale, dry, hard
29'6"	30'0"	AO				Dark gray shale, dry, hard
30'0"	30'10"	CW			10"	Black shale, hard, 4 pcs. 1" to 4"
30'10"	31'0"	CW			2"	Gray limestone, hard, 1 piece 2"
31'0"	32'10"	CW			9"	Gray shale, hard, 1 piece 9"

Cont'd.

DRILLER TO INDICATE: TIME AND DATE HOLE COMPLETED _____

TIME AND DATE WATER LEVEL RECORDED _____ Sheet 5 Appendix B

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. 665.9 RIG CME

DATE 5-15-68 BORING NO. C-4 Page 2

CONTRACT City of Fayette

ADDRESS Dam Site 11+45 ℄ Dam

CITY AND STATE Fayette, Missouri

WATER LEVEL _____ CASING USED Hollow Augers

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; R.B.—Rock Bit; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Shear Vane; C.W.—Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD Hydraulic Pressure	PENETRATION RECORD Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION — COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
32'10"	33'10"	CW			12"	Gray limestone, hard, 4 pcs. 1" to 7"
33'10"	34'5"	CW			7"	Gray limey shale, hard, 3 pcs. & crumbled, 1" to 2-1/2"
34'5"	34'10"	CW			5"	Gray limestone, hard, 1 piece 5"
34'10"	35'0"	CW			2"	Gray limey shale, hard, 1 piece 2"
35'0"	38'10"	CW			40"	Black shale, hard, 27 pcs. 1/2" to 5"
38'10"	40'0"	CW			14"	Gray shale, med. to hard, 4 pcs. 1" to 9"
40'0"	40'4"	CW			4"	Gray shale, soft, crumbled
40'4"	41'9"	CW			17"	Black coal, hard, 3 pcs. 4" to 8"
41'9"	43'0"	CW			15"	Gray shale, med. 3 pcs. 1/2" to 12"
43'0"	Total Depth					
Set Packer at 37' at 37 lbs. pressure. Water loss 1/10 gal. for 5 min.						At 32 lbs. pressure, set Packer at 32' 4:00 P.M. 4:01 P.M. Loss 1.65 gal. 4:02 P.M. " 1.7 " 4:03 P.M. " 1.6 " 4:04 P.M. " 1.7 " 4:05 P.M. " 1.7 " 4:10 P.M. " 8.9 " 4:15 P.M. " 7.4 "

DRILLER TO INDICATE:

TIME AND DATE HOLE COMPLETED 6 P.M. 5-15-68

TIME AND DATE WATER LEVEL RECORDED Sheet 1 of Drawing B

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. 665.0 RIG CME

DATE 5-8-68 BORING NO. D-7

CONTRACT City of Fayette

ADDRESS Dam Site 8+45 & Dam

CITY AND STATE Fayetto, Mo.

WATER LEVEL _____ CASING USED 15' Hollow Augers

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; P.B.—Rock Bit; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Shear Vane; C.W.—Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD Hydraulic Pressure	PENETRATION RECORD Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION (COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY)
0'0"	3'6"	RB				Brown clayey silt, moist, stiff
3'6"	5'0"	ST1	1.50		18"	Gray brown clayey silt, trace wood, moist, stiff
5'0"	8'6"	RB				Gray brown clayey silt, moist, stiff
8'6"	10'0"	ST2	1.50		18"	Gray brown clayey silt, moist, stiff
10'0"	13'6"	RB				Gray brown clayey silt, moist, stiff
13'6"	15'0"	ST3	.50		18"	Gray clayey silt, moist, med.
15'0"	18'6"	RB				Gray clayey silt, moist, med.
18'6"	20'0"	ST4	.50		18"	Gray clayey silt, moist, med.
20'0"	23'6"	RB				Gray clayey silt, moist, med.
23'6"	25'0"	ST5	.50		18"	Gray clayey silt, moist, med.
25'0"	28'6"	RB				Gray clayey silt, moist, med.
28'6"	30'0"	ST6	.50		18"	Gray clayey silt, tr. sand, moist, med.
30'0"	33'6"	RB				Gray clayey silt, tr. sand, moist, med.
33'6"	35'0"	ST7	1.50		18"	Gray sandy clay silt, moist, stiff
35'0"	38'6"	RB				Gray sandy clay silt, moist, stiff
38'6"	40'0"	ST8	1.00		18"	Gray sandy clay silt, moist, stiff
40'0"	43'6"	RB				Gray sandy clay silt, moist, stiff
43'6"	45'0"	ST9	3.00			Gray clay silt, moist, very stiff

(Cont'd)

DRILLER TO INDICATE:

TIME AND DATE HOLE COMPLETED _____

TIME AND DATE WATER LEVEL RECORDED _____

Sheet 7 Appendix B

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. CC2 665.0 RIG CME

DATE 5-8-68 BORING NO. D-7 Page 2

CONTRACT City of Fayette

ADDRESS Dam Site 8+45 & Dam

CITY AND STATE Fayette, Mo.

WATER LEVEL _____ CASING USED 15' Hollow Auger

ABBREVIATIONS: A.O.—Auger Only; R.B.—Rock Bit; S.V.—Shear Vane; S.A.—Sample Auger; S.S.—Split Spoon; C.W.—Core Water; W.B.—Wash Bore; S.T.—Shelby Tube; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD: Hydraulic Pressure	PENETRATION RECORD: Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION: COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
45'0"	47'9"	RB				Gray clayey silt, moist, very stiff
47'9"	50'0"	RB				Gray limey shale, dry, hard
50'0"	Total Depth					

DRILLER TO INDICATE: TIME AND DATE HOLE COMPLETED 7:30 P.M. 5-8-68

TIME AND DATE WATER LEVEL RECORDED

Sheet 8 Appendix B

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. 662.0 RIG CME

DATE 5-9-68 BORING NO. D-S

CONTRACT City of Fayette

ADDRESS Dam Site 7+45 ℄ Dam

CITY AND STATE Fayette, Mo.

WATER LEVEL _____ CASING USED _____

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; R.B.—Rock Bit; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Shear Vane; C.W.—Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD Hydraulic Pressure	PENETRATION RECORD Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
0'0"	3'6"	AO				Brown sandy clayey silt, moist, soft
3'6"	5'0"	ST1	0.25		17"	Brown sandy clayey silt, moist, soft
5'0"	8'6"	AO				Brown sandy clayey silt, moist, soft
8'6"	10'0"	ST2	.50		18"	Gray sandy clayey silt, moist, med.
10'0"	13'6"	AO				Gray sandy clayey silt, moist, med.
13'6"	15'0"	ST3	1.25		18"	Brown gray clayey silt, moist, stiff
15'0"	18'6"	AO				Brown gray clayey silt, moist, stiff
18'6"	20'0"	ST4	.75		18"	Brown gray clayey silt, moist, med.
20'0"	23'0"	WB				Gray clayey silt with sand seams, moist, med.
23'0"	23'6"	WB				Gray clayey silt, moist, soft
23'6"	25'0"	SS5	.00	3 3 3	18"	Gray clayey silt, moist, soft
25'0"	28'6"	WB				Gray clayey silt, moist, soft
28'6"	30'0"	ST6	.50		18"	Gray clayey silt, moist, med.
30'0"	33'6"	WB				Gray clayey silt, moist, med.
33'6"	35'0"	ST7	1.00		18"	Gray sandy clayey silt, moist, stiff
35'0"	38'6"	WB				Gray and black clayey silt, sand & gravel, moist, loose
38'6"	40'0"	ST8			18"	Gray and black clayey silt, sand & gravel, moist, loose
40'0"	41'6"	WB				Gray and black clayey silt, sand & gravel, moist, loose

(Cont'd) Sheet 9 Appendix B

DRILLER TO INDICATE:

TIME AND DATE HOLE COMPLETED _____

TIME AND DATE WATER LEVEL RECORDED _____

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. 662.0 RIG CME

DATE 5-9-68 BORING NO D-S Page 2

CONTRACT City of Fayette

ADDRESS Dam Site 7+45 L. DAM

CITY AND STATE Fayette, Mo.

WATER LEVEL _____ CASING USED _____

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; R.B.—Rock Bit; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Shear Vane; C.W.—Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD Hydraulic Pressure	PENETRATION RECORD Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
41'6"	43'6"	WB				Gray shaley silt, moist, stiff
43'6"	45'0"	ST9	1.00			Gray shaley silt, moist, stiff
45'0"	48'6"	WB				Gray shaley silt, moist, stiff
48'6"	50'0"	SS10		9 9	18"	Gray-brown-black clayey silt and gravel, moist, stiff
50'0"	52'0"	RB		11		Gray-brown-black clayey silt and gravel, moist, stiff
52'0"	55'0"	RB				Gray silty sandstone, moist, dense
55'0"	60'0"	RB				Gray silty sandstone, moist, dense
60'0"	65'0"	RB				Gray silty sandstone, moist, dense
65'0"	70'0"	RB				Gray silty sandstone, moist, dense
70'0"	75'0"	RB				Gray silty sandstone, moist, dense
75'0"	85'0"	RB				Gray silty sandstone, moist, dense
85'0"	Total Depth					

DRILLER TO INDICATE: TIME AND DATE HOLE COMPLETED _____

TIME AND DATE WATER LEVEL RECORDED _____

Sheet 10 Appendix A

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. ~~673~~ 662.1 RIG CME

DATE 5-16-68 BORING NO. D-11

CONTRACT City of Fayette

ADDRESS Dam Site 9+65 ℄ Dam

CITY AND STATE Fayette, Missouri

WATER LEVEL _____ CASING USED Hollow Augers

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; R.B.—Rock Bit; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Shear Vane; C.W.—Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD: Hydraulic Pressure	PENETRATION RECORD: Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION: COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
0'0"	3'6"	AO				Brown clayey silt, tr. moisture, hard
3'6"	5'0"	ST1	4.50+		18"	Brown clayey silt, tr. moisture, hard
5'0"	7'0"	AO				Brown clayey silt, tr. moisture, hard
7'0"	8'6"	AO				Gray brown sandy clay, trace gravel, moist, very stiff
8'6"	10'0"	ST2	2.75		18"	Gray brown sandy clay, trace gravel, moist, very stiff
10'0"	13'6"	AO				Gray brown sandy clay, trace gravel, moist, very stiff
13'6"	15'0"	ST3			18"	Gray brown sandy clay, trace gravel, small sand seams, moist, very stiff
15'0"	17'0"	AO				Gray brown sandy clay, trace gravel, small sand seams, moist, very stiff
17'0"	18'6"	AO				Gray shale, dry, hard
18'6"	19'6"	ST4	4.50+		12"	Gray shale, dry, hard
19'6"	Total	Depth				

DRILLER TO INDICATE:

TIME AND DATE HOLE COMPLETED 9:15 A.M. 5-16-68

TIME AND DATE WATER LEVEL RECORDED

Sheet 11 Appendix B

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. ~~1003~~ 695.7 RIG CME

DATE 5-13-68 BORING NO. D-13

CONTRACT City of Fayette

ADDRESS Dam Site 1+95 ℄ Dam

CITY AND STATE Fayette, Missouri

WATER LEVEL _____ CASING USED Hollow Augers

ABBREVIATIONS: A.O.—Auger Only; R.B.—Rock Bit; S.V.—Shear Vane; S.A.—Sample Auger; S.S.—Split Spoon; C.W. Core Water; W.B.—Wash Bore; S.T.—Shelby Tube; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD Hydraulic Pressure	PENETRATION RECORD Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
0'0"	3'6"	AO				Gray brown clayey silt, tr. moisture, hard
3'6"	5'0"	ST1	4.00		18"	Gray brown clayey silt, tr. moisture, hard
5'0"	8'6"	AO				Gray brown clayey silt, tr. moisture, hard
8'6"	10'0"	ST2	2.25		18"	Brown sandy clay, moist, very stiff
10'0"	13'6"	AO				Brown sandy clay, moist, very stiff
13'6"	15'0"	ST3	3.75		18"	Brown gray sandy clay, moist, very stiff
15'0"	18'6"	AO				Brown gray sandy clay, moist, very stiff
18'6"	20'0"	ST4	4.50+		18"	Brown gray sandy clay, moist, hard
20'0"	23'6"	AO				Brown gray sandy clay, moist, hard
23'6"	25'0"	ST5	1.75		18"	Brown clayey silt, moist, stiff
25'0"	28'6"	AO				Brown clayey silt, moist, stiff
28'6"	30'0"	ST6	3.25		18"	Brown clayey silt, moist, very stiff
30'0"	33'6"	AO				Brown clayey silt, moist, very stiff
33'6"	34'10"	ST7	)		12"	Brown clayey silt, moist, very stiff
34'10"	35'0"	"	4.50+		6"	Brown sandstone, tr. moisture, hard
35'0"	Refusal					

DRILLER TO INDICATE:

TIME AND DATE HOLE COMPLETED 6"25 P.M. 5-13-68

TIME AND DATE WATER LEVEL RECORDED Sheet 12 Appendix B

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. [illegible] 707.2 RIG CME

DATE 5-20-68 BORING NO. C-16

CONTRACT City of Fayette

ADDRESS Dam Sire 2+05 ± 5' Rt. (CL)

CITY AND STATE Fayette, Mo.

WATER LEVEL Before coring dry CASING USED Hollow Augers

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; R.B.—Rock Bit; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Shear Vane; C.W.—Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD: Hydraulic Pressure	PENETRATION RECORD: Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION: COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
						med.
0'0"	2'0"	AO				Black & brown clayey silt, top soil, moist
2'0"	3'6"	AO				Gray brown clayey silt, moist, very stiff
3'6"	5'0"	ST1	2.50		18"	Same
5'0"	8'0"	AO				Same
8'0"	8'6"	AO				Yellow brown weathered shale, trace gravel, tr. moisture, hard
8'6"	10'0"	ST2	4.50+		18"	Same
10'0"	13'6"	AO				Same
13'6"	15'0"	ST3	4.50+		13"	Same
15'0"	18'6"	AO				Same
18'6"	20'0"	ST4	4.50+		17"	Yellow brown weathered shale, trace gravel, moist, hard
20'0"	22'9"	AO				Same
22'9"	23'6"	AO				Gray shale, dry, hard
23'6"	24'0"	ST5	4.50+		6"	Same
24'0"	25'0"	AO				Same
25'0"	35'0"	CW			115"	Gray shale, med. to hard, 21 pcs. 1/2" to 31"
35'0"	Total Depth					

DRILLER TO INDICATE:

TIME AND DATE HOLE COMPLETED 12 noon 5-20-68

TIME AND DATE WATER LEVEL RECORDED 11 A.M. [illegible] 4" [illegible]

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. [illegible] 683.0 RIG CME

DATE 5-21-68 BORING NO. C 20

CONTRACT City of Fayette

ADDRESS Dam Site 8+20 ℄ PWY (CL)

CITY AND STATE Fayette, Mo.

WATER LEVEL Before coring dry CASING USED hollow augers

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; R.B.—Rock Bit; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Shear Vane; C.W.—Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD Hydraulic Pressure	PENETRATION RECORD Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
0'0"	3'6"	AO				Yellow gray clayey shale, dry, hard
3'6"	4'0"	ST1	4.50+		6"	Same
4'0"	8'6"	AO				Same
8'6"	9'0"	ST2	4.50+		6"	Brown gray shale, dry, hard
9'0"	11'0"	AO				Same
11'0"	13'3"	CW			15"	Brown gray med. to soft shale, 7 pcs. 1/2" to 7"
13'3"	21'0"	CW			93"	Gray med. shale, 21 pcs. 1/2" to 19"
21'0"	23'4"	CW			28"	Gray shale, hard, 3 pcs. 4" to 13"
23'4"	23'8"	CW			4"	Gray limestone, hard, 1 pc. 4"
23'8"	25'11"	CW			27"	Black shale, hard, 5 pcs. 1" to 11"
25'11"	27'1"	CW			14"	Black coal, hard, 7 pcs. 1" to 3"
27'1"	31'0"	CW			35"	Gray shale with limestone nodules, 12 pcs. & crumbled, 1" to 10"
31'0"	Total Depth					

DRILLER TO INDICATE:

TIME AND DATE HOLE COMPLETED 4:00 P.M. 5-21-68

TIME AND DATE WATER LEVEL RECORDED 3:00 P.M. "

[illegible]

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. 680.5 RIG CME

DATE 5-16-68 BORING NO. 7

CONTRACT City of Fayette

ADDRESS Dam Site (Borrow)

CITY AND STATE Fayette, Missouri

WATER LEVEL dry CASING USED none

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; P.B.—Post Ho[illegible]; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Shear Vane; C.W.—Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD Hydraulic Pressure	PENETRATION RECORD Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
0'0"	2'6"	AO				Gray brown clayey silt, moist, stiff
2'6"	3'6"	AO				Gray brown clayey silt, dry, very stiff
3'6"	5'0"	SS1	4.50+	10 12 15	18"	Gray brown clayey silt, dry, very stiff
5'0"	6'0"	AO				Gray brown clayey silt, dry, very stiff
6'0"	8'6"	AO				Gray silty clay, moist, stiff
8'6"	10'0"	SS2	2.75	4 5 8	18"	Gray silty clay, moist, stiff
10'0"	13'6"	AO				Gray silty clay, moist, stiff
13'6"	15'0"	SS3	2.75	4 4 5	18"	Gray silty clay, moist, stiff
15'0"	Total Depth					

DRILLER TO INDICATE:

TIME AND DATE HOLE COMPLETED 1 P.M. 5-16-68

TIME AND DATE WATER LEVEL RECORDED " "

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. 682.0 RIG CME

DATE 5-16-68 BORING NO. 11

CONTRACT City of Fayette

ADDRESS Dam Site (Borrow)

CITY AND STATE Fayette, Missouri

WATER LEVEL dry CASING USED none

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; R.B.—Rock Bit; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Shear Vane; C.W.—Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD Hydraulic Pressure	PENETRATION RECORD Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
0'0"	2'6"	AO				Top soil
2'6"	3'6"	AO				Gray brown silty clay, moist, stiff
3'6"	5'0"	SS1	2.25	5 5 6	18"	Gray brown silty clay, moist, stiff
5'0"	8'6"	AO				Gray brown silty clay, moist, stiff
8'6"	10'0"	SS2		3 5 7	18"	Gray brown clay, moist, stiff
10'0"	12'0"	AO				Gray brown clay, moist, stiff
12'0"	13'6"	AO				Gray brown clay, moist, stiff
13'6"	15'0"	SS3	3.00	5 5 7	18"	Gray brown silty clay, moist, stiff
15'0"	Total	Depth				

DRILLER TO INDICATE:

TIME AND DATE HOLE COMPLETED 2:30 P.M. 5-16-68

TIME AND DATE WATER LEVEL RECORDED " "

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. _____ RIG CME

DATE 5-16-68 BORING NO. 17

CONTRACT City of Fayette

ADDRESS Dam Site (Borrow)

CITY AND STATE Fayette, Missouri

WATER LEVEL 12'7" CASING USED none

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; R.B.—Rock Bit; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Sheer Vane; C.W.—Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD Hydraulic Pressure	PENETRATION RECORD Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
0'0"	0'4"	AO				Top soil
0'4"	3'6"	AO				Gray brown silty clay, moist, med.
3'6"	5'0"	SS1	2.00	4 4 5	18"	Gray brown silty clay, moist, med.
5'0"	8'6"	AO				Gray brown silty clay, moist, med.
8'6"	10'0"	SS2	.50		18"	Gray brown clayey silt, moist, soft
10'0"	12'0"	AO				Gray brown clayey silt, moist, soft
12'0"	13'6"	AO				Black coal and shale, trace moisture, very stiff
13'6"	15'0"	SS3		7 9 11		Black coal and shale, trace moisture, very stiff
15'0"	Total Depth					

DRILLER TO INDICATE:

TIME AND DATE HOLE COMPLETED 4:00 P.M. 5-16-68

TIME AND DATE WATER LEVEL RECORDED " "

LAYNE-WESTERN COMPANY

1010 West 39th Street
Kansas City, Missouri

DRILLER L. B. Henry

SURFACE ELEV. _____ RIG CME

DATE 6-12-68 BORING NO. 20

CONTRACT City of Fayette

ADDRESS Dam Site (Borrow)

CITY AND STATE Fayette, Missouri

WATER LEVEL dry CASING USED none

ABBREVIATIONS: A.O.—Auger Only; S.A.—Sample Auger; W.B.—Wash Bore; R.B.—Rock Bit; S.S.—Split Spoon; S.T.—Shelby Tube; S.V.—Shear Vane; C.W. Core Water; C.A.—Core Air

DEPTH From	DEPTH To	METHOD	PENETRATION RECORD Hydraulic Pressure	PENETRATION RECORD Number of Blows	CORE RECOVERY	SAMPLE DESCRIPTION COLOR—MATERIAL—MOISTURE—CLAY CONSISTENCY SAND DENSITY
0'0"	1'0"	AO				Top soil
1'0"	3'6"	AO		4		Brown clayey silt, moist, stiff
3'6"	5'0"	SS1	4.50	6 7		Same
5'0"	8'6"	AO				Same
8'6"	10'0"	SS2	3.00	6 10	16"	Brown to gray weathered shale to shale, trace moisture, very stiff
10'0"	15'0"	AO		10		Gray to black shale, dry, very stiff
15'0"	Total Depth					

DRILLER TO INDICATE:

TIME AND DATE HOLE COMPLETED 11 A.M. 6-12-68

TIME AND DATE WATER LEVEL RECORDED _____ _____

Sheet 12 Appended

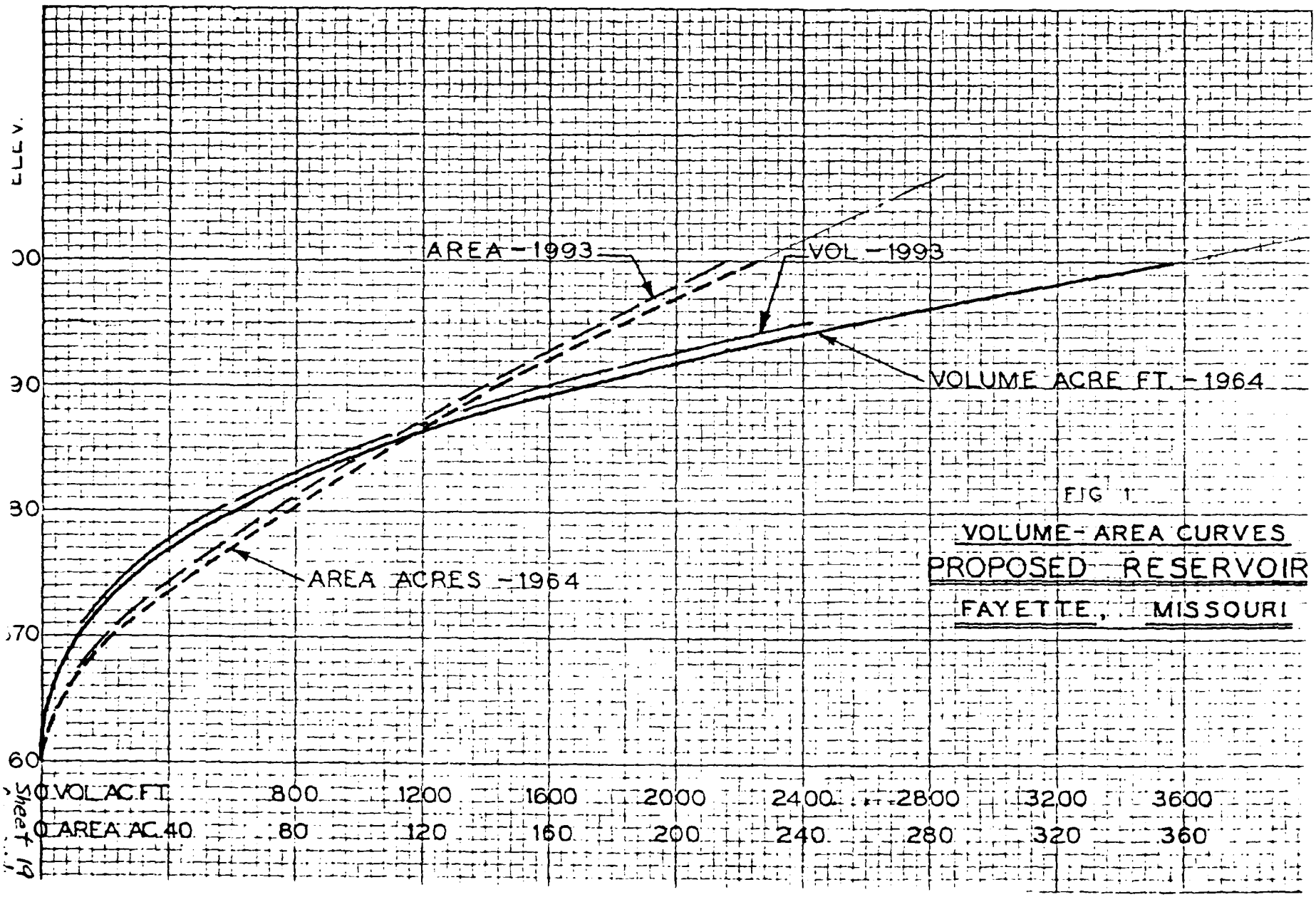


FIG 1

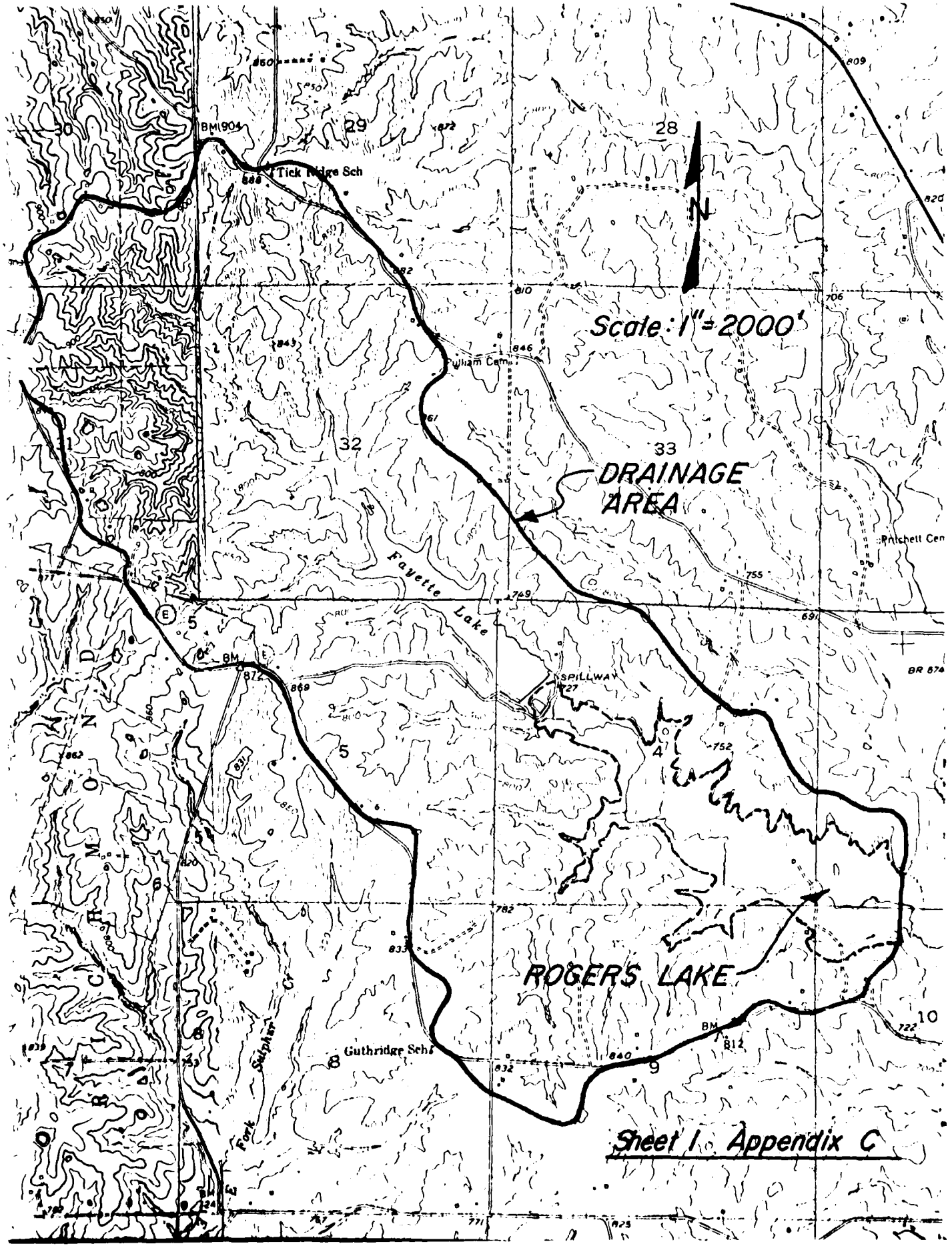
VOLUME - AREA CURVES

PROPOSED RESERVOIR

FAYETTE, MISSOURI

Sheet 19

APPENDIX C


Scale: 1" = 2000'
DRAINAGE AREA
ROGER'S LAKE
Fayette Lake
SPILLWAY
Tick Ridge Sch
Guthridge Sch
Pritchett Cen
BM 904
BM 872
BM 812
Sheet 1, Appendix C

HYDRAULICS AND HYDROLOGIC DATA

Design Data: From Contract Drawings and Field Measurements.

Experience Data: No records for high water marks are available. A city employee indicated that he believed that the emergency spillway had come into operation only once. There are indications that the primary spillway has operated many times. There is considerable erosion and displacement of riprap at the end of the stilling basin.

Visual Inspection; At the time of inspection, the pool level was 694.19 about 0.81 ft below normal pool (elevation 695.0).

Overtopping Potential: Flood routings were performed to determine the overtopping potential. Since the dam is of intermediate size with a high hazard rating, a spillway design storm of 100 percent of the PMF was prescribed by the guidelines. The watershed drainage area was obtained by plainimeter from the U.S.G.S. 7.5 minute Glasgow and Fayette, Missouri quadrangle maps. The values of the drainage areas obtained for the total watershed and for the upstream reservoir, were larger than those included in the Larkin & Associates Report (Addendum to Engineering Study). In our computations the larger values were used. During our studies we assumed that the upstream dam (Fayette Lake) will not reduce the effect of the PMF. The whole watershed area above Rogers Lake Dam was used in the analysis. We recommend that a breach study of the upstream dam should be analyzed to determine its consequences on the Rogers Lake Dam.

The values for the reservoir area and the storage-elevation relationship were used from the Larkin & Associates report.

A 5 minute interval unit-graph was developed for the watershed which resulted in a peak inflow of 3195 c.f.s. and a time to peak of 35 minutes. Application of the probable maximum precipitation, minus losses resulted in a flood hydrograph peak inflow of 26,688 c.f.s. Rainfall distribution for the 24 hour storm was according to EM 1110-2-1411.

Considering all factors the combination of dam, spillway and storage is not sufficient to pass the PMF without overtopping the embankment. The crest elevation of 703.50 ft would be overtooped by 1.47 ft at flood pool elevation 704.97.

Fifty percent of the PMF was routed through the spillway and reached a pool elevation of 700.32 ft, which is 3.18 ft below the crest. The portion of the PMF that will just reach the top of dam is about 73 percent which is greater than the 100 year flood event. For additional information see the Summary of Dam Safety Analyses on Sheets 3 and 4.

OVERTOPPING ANALYSIS FOR Rogers Lake Dam

INPUT PARAMETERS

1. Unit Hydrograph - SCS Dimensionless - Flood Hydrograph Package (HEC-1); Dam Safety Version Was Used.
   Hydraulic Inputs Are As Follows:

   a. Twenty-four Hour Rainfall of 25 Inches For 200 Square Miles - All Season Envelope

   b. Drainage Area = 2510 Acres; = 3.92 Sq. Miles

   c. *Travel Time of Runoff 0.92 Hrs.; Lag Time 0.55 Hrs.

   d. Soil Conservation Service Runoff Curve No. 80 (AMC III)
      Hydrologic Soil Group B

   e. Proportion of Drainage Basin Impervious 0.10

2. Spillways

   a. Primary Spillway: Drop Inlet Structure with 54" Ø RCP

      (Crest Elev. = 695.0)

   b. Emergency Spillway: Trapezoidal Cut (Seeded), Concrete Sill at Control Section (Crest Elev. = 697.5).
      Length 100 Ft.; Side Slopes 3:1 ; C = 2.65

   c. Dam Overflow

      Length 1350 Ft.; Side Slopes Vertical; C = 3.0

   Note: Combined Spillway and Dam Rating Data Provided To Computer on Y4 and Y5 Cards.

SUMMARY OF DAM SAFETY ANALYSIS

1. Unit Hydrograph

   a. Peak - 3195 c.f.s.

   b. Time to Peak 35 Min.

2. Flood Routings Were Computed by the Modified Puls Method

   a. Peak Inflow (see Sheet 6)

      50% PMF 13,344 c.f.s.; 100% PMF 26,688 c.f.s.

*From Equation $Tc = \frac{(11.9\ L^3)}{H}\ 0.385$, California Culvert Practice, California Highways and Purlic Works, Sept. 1942

b. Peak Elevation

50% PMF 700.32 100% PMF 704.97

c. Portion of PMF That Will Reach Top of Dam

73 %; Top of Dam Elev. 703.5 Ft.

3. Computer Input and Output Data Sheets 5 and 6 Appendix C

ROGERS LAKE DAM-PROBABLE MAXIMUM FLOOD (INPUT DATA)

```
1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JUL 1978
   LAST MODIFICATION  3 AUG 78
 **********
     1                A        OVERTOPPING ANALYSIS FOR ROGERS LAKE DAM #8 HEC-1
     2                A        CO CODE 089 CO NAME HOWARD STATE ID NO MD 10370 OC
     3                A                HANSON ENGINEERS INC  DAM SAFETY INSPECTI
     4                B    300         0         5         0         0         0         0
     5                B1     5
     6                J      1         8         1
     7                J1   0 1       0 3       0.5       0 70      0 75      0 80      0 90
     8                K      0         1                             0         0         1
     9                K1       INFLOW HYDROGRAPH COMPUTATION
    10                M      1         2      3 92                 3 92         1
    11                P      0        25       102       120       130
    12                T                                                              -1
    13                W2   0.92      0 55
    14                X      0      -.10         2
    15                K      1         2                                          1
    16                K1       RESERVOIR ROUTING BY MODIFIED PULS AT ROGERS DAM
    17                Y                                        1         1
    18                Y1     1                                                    1000
    19                Y4   695       696     697.5     700 5     703 5       705       708
    20                Y5     0       100       450      1960      5080      7170     12370
    21                $S     0      2560      2750      3050      3700      4400      4780
    22                $E   660       695       696     697.5     700.5     703.5       705
    23                $$   695
    24                $D 703.5       3.0       1.5      1350
    25                K     99
```

```
)GEPS LAKE DAM #8 HEC-I DAM SAFETY
 STATE ID NO.MO.10370 OWR FAYETTE CITY PARK BD
#C  DAM SAFETY INSPECTION )JOB NO 03778)
      0         0         0         0         0         0


   0 75      0 80      0 90       1.0
      0         0         1
ION
   3 92         1                             1
    130
                           -1       -80                0.10


                           1
IED PULS AT ROLGERS DAM
      1
                        1000        -1
 703 5       705        708
  5080      7170      12370
  3700      4400      4780      5700
 700.5     703.5       705       708
```

Sheet 5, Appendix C

LAKE DAM-PRO[illegible]

LAKE DAM-PR[illegible]

PEAK [illegible]

PERIOD SUMMARY FOR MULTIPLE PLAN-RATI
CUBIC FEET PER SECOND CUBIC METERS PE
AREA IN SQUARE MILES (SQUARE KILOMETERS)

LOCATION	STATION			RATIOS APPLIED TO FL RATIO 1 0.10	RATIO 2 0.30	RATIO 3 0.50	RATIO 4 0.70
[illegible]SH AT	1			2649 75.07	8006 226.71	13344 377.86	18681. 529.00
				0 0.00	167 4.73	1869 52.93	4622 130.81

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

	INITIAL VALUE	SPILLWAY CREST
ELEVATION	673.67	695.00
STORAGE	1000	2560
OUTFLOW	0	0

RATIO OF PMF	MAXIMUM RESERVOIR W.S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DUR OVE HO
0.10	692.23	0.00	1630.	0	0
0.30	696.29	0.00	2808.	167.	0
0.50	700.32	0.00	3661.	1369.	0
0.70	703.06	0.00	4297.	4522.	0
0.75	703.63	0.13	4434.	5163.	1
0.80	703.96	0.46	4516.	6972.	1
0.90	704.48	0.98	4647.	10346.	2
1.00	704.97	1.47	4774.	14388.	2

OR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
OND (CUBIC METERS PER SECOND)
(SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS

RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8
0.50	0.70	0.75	0.80	0.90	1.00
13344	18681.	20016.	21350.	24019.	26688.
377.86)	529.00)(	566.78)(	604.57)(	680.14)(	755.71)
1869	4622	5463.	6972.	10346.	14388.
52.93)(	130.87)(	154.70)(	197.43)(	292.98)(	407.42)

F DAM SAFETY ANALYSIS

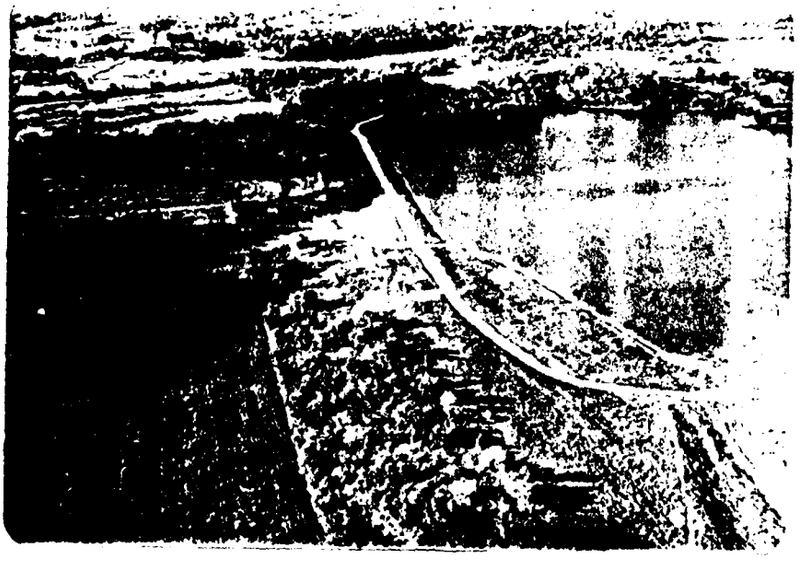
SPILLWAY CREST	TOP OF DAM
695.00	703.50
2560	4400.
0.	5080.

UM SE T	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.	0	0.00	0.00	0.00
0.	167.	0.00	24.33	0.00
1.	1369.	0.00	18.67	0.00
7.	4522.	0.00	18.33	0.00
4.	5163.	1.08	18.17	0.00
6.	6972.	1.92	17.58	0.00
7.	10346.	2.58	17.00	0.00
4.	14388.	2.83	16.25	0.00

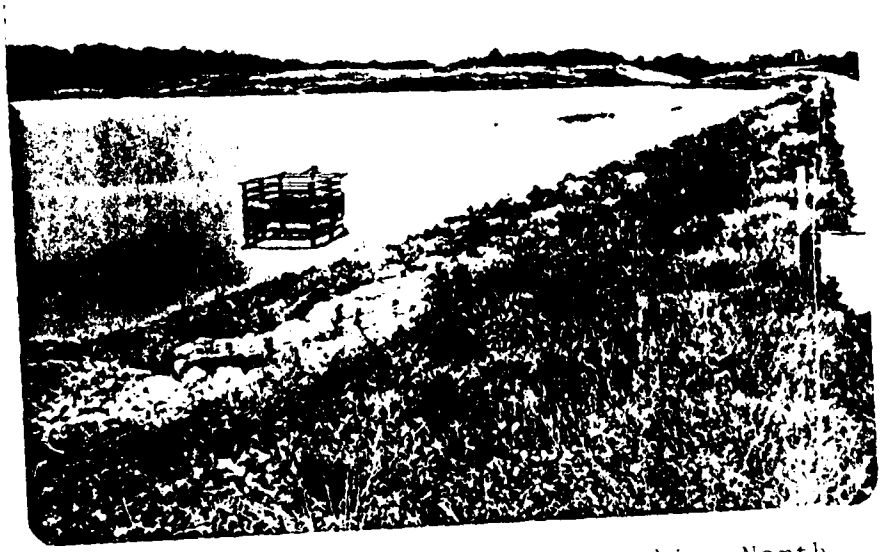
.2

APPENDIX D

Aerial View of Dam and Lake - Looking Northeast

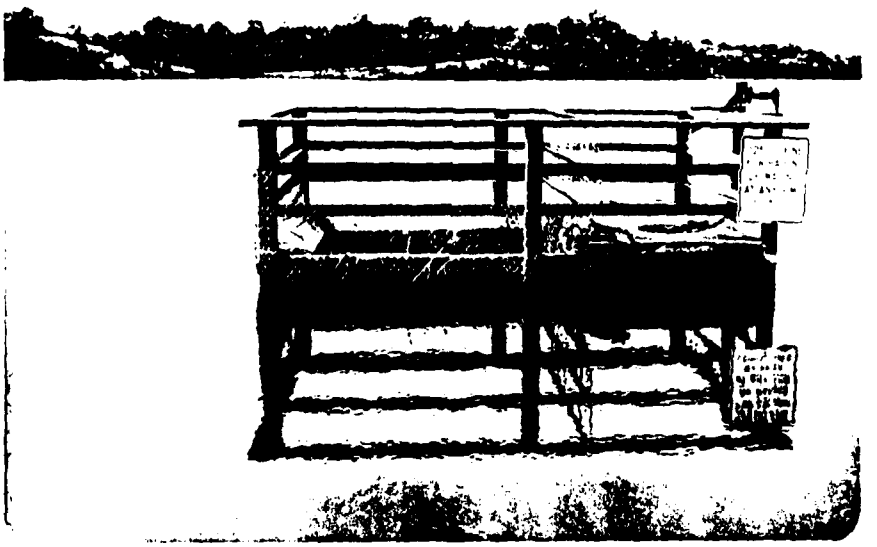


Aerial View - Looking South, Emergency Spillway at Lower Right

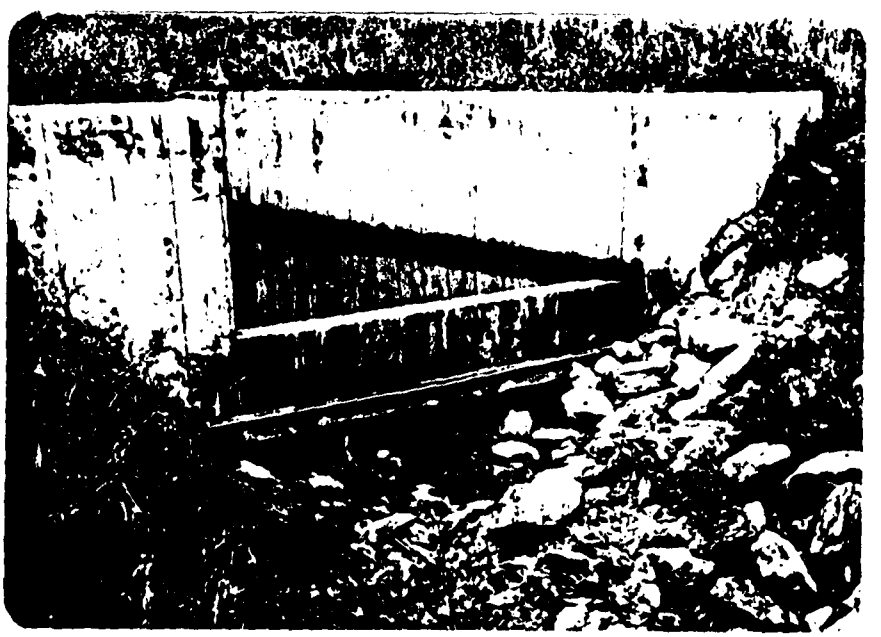


Upstream Slope of Dam - Looking North

Downstream Slope of Dam - Looking North



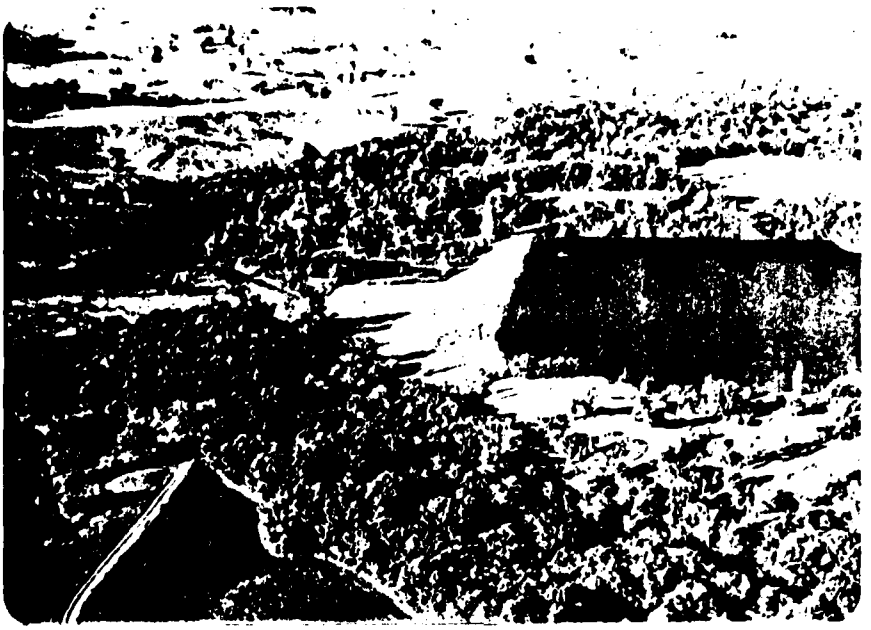
Primary Spillway Inlet



Primary Spillway Outlet - Note Erosion

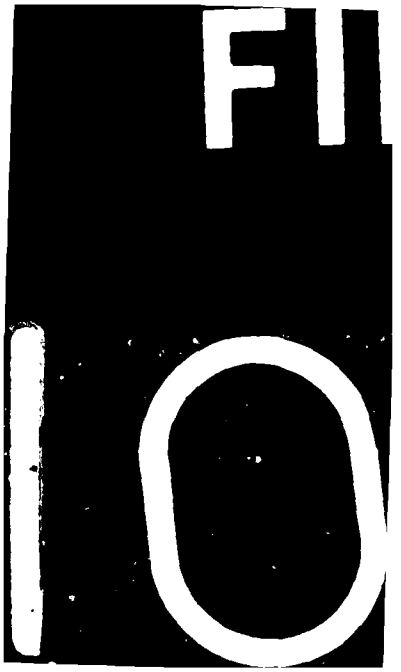
Emergency Spillway - Looking Upstream

Erosion South Abutment Near Primary Spillway Outlet



Aerial View of Upper Fayette Dam - Looking South

Spillway - Upper Fayette Dam


FI
10